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ABSTRACT

One of three individualized courses included in a plumbing curriculum, this course focuses on planning, preparing, and assembling the rough-in portions of drainage, waste, and vent systems. The course is comprised of two units: (1) Pipe and Fittings Assembly and (2) Planning, Layout, and Assembly. Each unit begins with a Unit Learning Experience Guide that gives directions for unit completion. The remainder of each unit consists of Learning Activity Packages (LAP) that provide specific information for completion of a learning activity. Each LAP is comprised of the following parts: objective, evaluation procedure, resources, procedure, supplemental sheets, study guide, and a LAP test with answers. The course is preceded by a pretest which is designed to direct the student to units and performance activities. (LRA)

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ED197184

MOUNTAIN PLAINS LEARNING EXPERIENCE GUIDE:

Plumbing.

Course: Drainage and Vent Systems.

CE 027 814

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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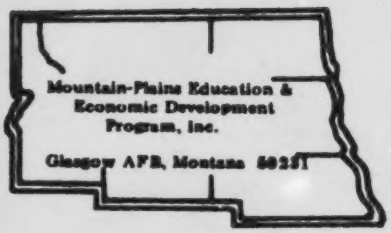

Learning Experience Guide

COURSE: DRAINAGE AND VENT SYSTEMS

DESCRIPTION:

This course is about plumbing rough-in installations. The rough-in includes installing, revising and repairing drainage and ventilation systems for general residential/commercial structures including connections to sewer systems.

Installation activities involve the identification, design, planning and assembly of hub and no-hub cast iron soil pipe, plastic pipe and threaded iron pipe. Identification includes nomenclature and characteristics of the various types of pipe and fittings. The design activities for this course involve determining the discharge capacity of pipe recognizing, when and where to use the various types of pipe, and applying the relationship of various drains, traps, and fittings design characteristics to an intended function in specific drainage and vent system application. Planning activities involve determination of material, equipment and tool needs to prepare and assemble all or part of a drainage and vent system as indicated by the job specifications. Drain and vent assembly involves the preparation and installation of pipe and fittings using procedures that meet established standards for safety and construction codes and satisfy the specifications for the job.

Servicing activities for plumbing drainage and ventilation systems involve the removal of obstructions and adjustments to valves in existing systems.

Repair activities for rough-in installations includes replacement or modification of some part of an existing system.

RATIONALE:

Mastery of the activities included in this course will provide the student with entry level skills for performing the plumbing rough-in tasks assigned to plumbers.

OBJECTIVES:

Plan, prepare and assemble the rough-in portions of drainage, waste and vent systems according to given specifications (codes, manufacturer's and customer's) using safe practices and acceptable procedures.

PREREQUISITES:

Course: "General Procedures and Practices for Building Trades and Services."

Principal Author(s): T. Bundy

Student: _____ File Code: 73.01.00.00.A2-2

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Mountain-Plains Education & Economic Development Program, Inc.
Kalispell AFB, Montana 59901

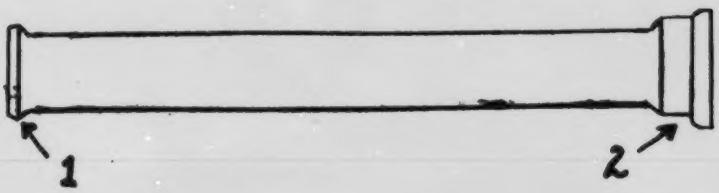
COURSE PRETEST: DRAINAGE AND VENT SYSTEMS

73.01.01.01

1. In how many different lengths is no hub soil pipe available?

   a. two.
   b. one.
   c. three.
   d. four.

THE ILLUSTRATION BELOW IS PROVIDED FOR THE FOLLOWING TWO QUESTIONS.



2. Identify item #1.

   a. cover.
   b. cap.
   c. spigot.
   d. insert cap.

3. Which of the following correctly identifies item #2?

   a. Cover.
   b. Cap.
   c. Hub.
   d. Spigot.

4. With which of the following tools is soil pipe cut?

   a. Knife.
   b. Hammer and cold chisel.
   c. Portable handsaw.
   d. Table saw.

5. When cutting no hub soil pipe, how much tolerance must be allowed for the couplings to join no hub pipe and/or fittings?

   a. 1".
   b. ½".
   c. 3/4 ".
   d. ¼".

73.01.01.02

6. What are the two methods used to join hub type soil pipes and fittings?

   a. Caulked lead and hub gasket.
   b. Hub gasket and cementing.
   c. Welding and caulked lead.
   d. Hub gasket and welding.

7. What color must lead be before it is ready to be poured?

   a. An orange tinge.
   b. A reddish tinge.
   c. A white tinge.
   d. A bluish tinge.

8. Lead caulked joints are usually the easiest to make when pipes are in which of the following positions?

   a. Vertical.
   b. Horizontal.
   c. Diagonal.
   d. Either the horizontal or vertical.

9. Why should a plumber making a lead caulked joint be particularly aware of moisture around the edge of fittings?

   a. The moisture will cause the molten lead to splatter.
   b. The moisture will cause the fittings to expand.
   c. The moisture will cause the fittings to contract.
   d. The moisture prohibits a good bond.

10. Why is oakum used around pipe fittings?

    a. To provide support for the fittings.
    b. To simply take up space, thereby saving on the amount of lead used.
    c. To provide a cushion for the fittings; absorbs underground shocks.
    d. To help waterproof the joint.

73.01.01.03

11. Which of the following is one of the five (5) different bends available in soil pipe?

    a. 1/15.
    b. 1/3.
    c. 1/7.
    d. 1/4.

12. To identify the right and left hand side of a soil pipe bend, look into the:

    a. spigot end with the hub end down or toward you.
    b. hub end with the spigot end down or toward you.
    c. hub end with the spigot end up or away from you.
    d. spigot end with the hub end up or away from you.

13. For proper sewage flow in a drainage system, it is necessary to connect the branches to all horizontal pipes or runs at an angle no greater than:

    a. 60 degrees.
    b. 15 degrees.
    c. 30 degrees.
    d. 45 degrees.

14. How many weights of cast are used in no-hub fittings?

    a. two.
    b. one.
    c. three.
    d. four.

15. In how many patterns are quarter bends available?

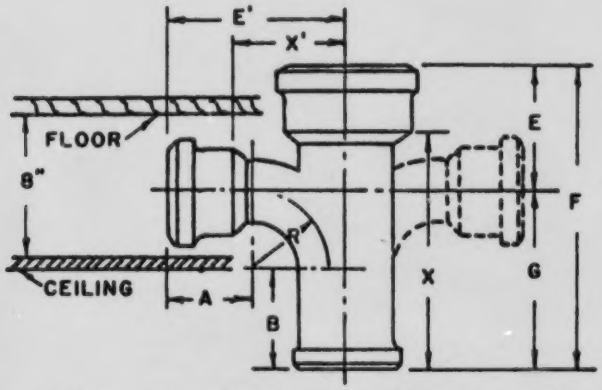
    a. 2.
    b. 3.
    c. 4.
    d. 1.

73.01.01.04

16. Why does a test tee have a larger branch?

    a. to increase the fluid flow.
    b. to allow space for inserting a proving plug.
    c. to decrease fluid flow.
    d. to adapt to more sizes of fittings.

THE FOLLOWING ILLUSTRATION AND CHART ARE TO BE USED FOR THE NEXT FOUR QUESTIONS.



SINGLE & DOUBLE SANITARY "T" BRANCHES

SIZE	A	B	E	E^1	F	G	R	X	X^1	Weight Single	Weight Double
2	$2\frac{3}{4}$	$3\frac{1}{4}$	$4\frac{1}{4}$	$5\frac{1}{4}$	$10\frac{1}{2}$	$6\frac{1}{4}$	$2\frac{1}{2}$	8	$2\frac{3}{4}$	8	11
3	$3\frac{1}{4}$	4	$5\frac{1}{4}$	$6\frac{3}{4}$	$12\frac{3}{4}$	$7\frac{1}{2}$	$3\frac{1}{2}$	10	4	16	21
4	$3\frac{1}{2}$	4	6	$7\frac{1}{2}$	14	8	4	11	$4\frac{1}{2}$	22	29
5	$3\frac{1}{2}$	4	$6\frac{1}{2}$	8	15	$8\frac{1}{2}$	$4\frac{1}{2}$	12	5	28	36
3 × 2	3	4	$4\frac{3}{4}$	$6\frac{1}{2}$	$11\frac{3}{4}$	7	3	9	4	14	18
4 × 2	3	4	5	7	12	7	3	9	$4\frac{1}{2}$	17	21
4 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{1}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	$4\frac{1}{2}$	20	25
5 × 2	3	4	5	$7\frac{1}{2}$	12	7	3	9	5	20	24
5 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{3}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	5	23	28

17. If the branch of a 4" sanitary tee is 4" below the underside of the floor, what is the distance to the bottom of the bead below the ceiling?

a. 3 ½" below the ceiling.
b. 4" below the ceiling.
c. 3 3/4" below the ceiling.
d. 3 5/8" below the ceiling.

18. What is the distance from the center of the branch to the top of the bell on a 5 inch sanitary tee?

    a. 5½".
    b. 6".
    c. 6½"
    d. 7".

19. What is the distance of a 5 inch sanitary tee from the center of the run to the end of the branch?

    a. 8".
    b. 8½".
    c. 7½".
    d. 8 3/4".

20. What is the angle of the branch from the run of a sanitary tee?

    a. 180 degrees.
    b. 72 degrees.
    c. 45 degrees.
    d. 90 degrees.

73.01.01.05

21. Which of the following soil pipe fittings is used to join a threaded pipe to a soil pipe hub?

    a. caulking sleeve.
    b. vent cowl.
    c. backwater valve.
    d. pipe increaser.

22. A pipe reducer is used to:

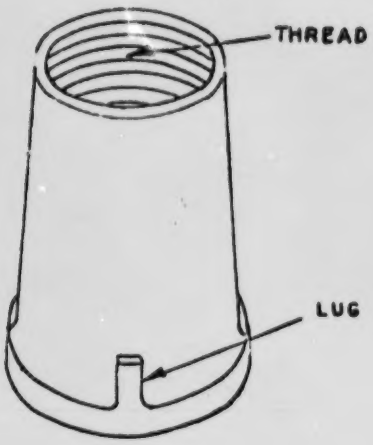
    a. prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
    b. enlarge the vent opening in cold climates to prevent it from frosting closed.
    c. join a threaded pipe to a soil pipe hub.
    d. decrease the size of large drains when the capacity of the system changes.

23. Which of the following soil pipe fittings is used to prevent sewage from flowing back into the system?

    a. Vent cowl.
    b. insertable joint.
    c. backwater valve.
    d. pipe reducer.

24. What type of soil pipe fitting is illustrated below?

    a. Pipe reducer.
    b. Pipe increaser.
    c. Insertable joint.
    d. Caulking sleeve.



25. Which of the following soil pipe fittings is used to simplify hub type soil pipe repair work and alterations?

    a. Backwater valve.
    b. Vent cowl.
    c. Pipe increaser.
    d. Insertable joint.

73.01.01.06

26. Steel, brass or copper pipes, being rigid, must be supported about every:

    a. 10 feet.
    b. 20 feet.
    c. 15 feet.
    d. 3 feet.

27. What type of pipe support should a plumber use to fasten two ½" water pipes to a side wall?

    a. Split ring hanger, screwed.
    b. Clevis hanger, bolted.
    c. Perforated strap iron, bolted.
    d. Pipe straps, screwed.

28. What should a plumber use to support a flat steam coil from a wood joist?

    a. F. and M. hanger.
    b. Perforated strap iron.
    c. Coil hanger.
    d. Split ring hanger.

fig. #1

fig. #2

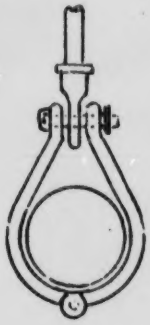


fig. #3

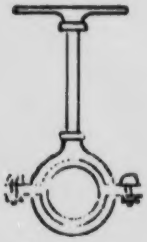


fig. #4

29. Which of the figures provided above illustrate a clevis hanger?

    a. 3.
    b. 1.
    c. 2.
    d. 4.

30. An F. and M. hanger is illustrated by figure number:

    a. 2.
    b. 1.
    c. 4.
    d. 3.

73.01.01.07

31. Which of the following statements is true about plastic pipe?

    a. Light weight.
    b. Ability to withstand temperature over 150 degrees fahrenheit.
    c. Ability to withstand pressures over 100 to 200 lbs.
    d. Inexpensive.

32. Which of the following statements is not true about plastic pipe?

    a. May be bent under heat.
    b. Resists corrosion and electrolysis.
    c. Good for long runs underground.
    d. Withstands temperature over 150 degrees fahrenheit.

33. Why is plastic pipe not threaded with dies that have been used on steel pipe?

    a. Plastic pipe requires a softer die than does steel.
    b. Metal residue or chips can damage the plastic pipe.
    c. Worn or dull dies will not cut threads on plastic pipe.
    d. Plastic pipe requires a harder die than does steel.

34. Would it be possible to lift 100,000 pounds of steel with a 1" x 1" plastic bar?

    a. Possibly.
    b. Yes.
    c. Definitely not.
    d. Occasionally.

35. On a job where plastic pipe is used for the house service pipe, would the same pipe be used for the basement main? Why?

    a. No, plastic pipe tends to sag; must be supported at 3 foot intervals.
    b. Yes, this would allow all service pipes and mains to have a common adaptability to one another.
    c. No, plastic pipe cannot withstand the pressure required for the basement main.
    d. No, plastic pipe cannot withstand the temperature variation required for the basement main.

73.01.01.08

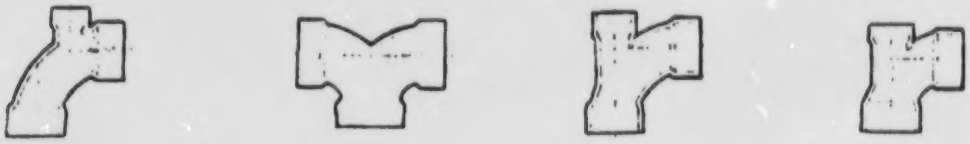
36. Plastic angle fittings are used to:

    a. increase the size of the pipe being used.
    b. reduce the size of the pipe being used.
    c. change the direction of the single pipe.
    d. filter debris from a single pipe.

37. Fitting composition of a plastic angle fitting should match the pipe for a given installation unless:

a. the fitting is to be welded to the pipe.
b. special adhesives are used.
c. a loose fitting installation is called for.
d. the specifications are in error.

THE FOLLOWING QUESTION REFERS TO THE ILLUSTRATIONS PROVIDED BELOW:



#1 #2 #3 #4

38. Which of the figures provided above identify an extra long turn 90 degree Ell with a high heel inlet?

a. #1.
b. #2.
c. #3.
d. #4.

THE FOLLOWING QUESTIONS REFER TO THE ILLUSTRATION PROVIDED BELOW:

#1 #2 #3 #4

39. Which of the above figures illustrates a closet bend reducing?

a. #2.
b. #4.
c. #3.
d. #1.

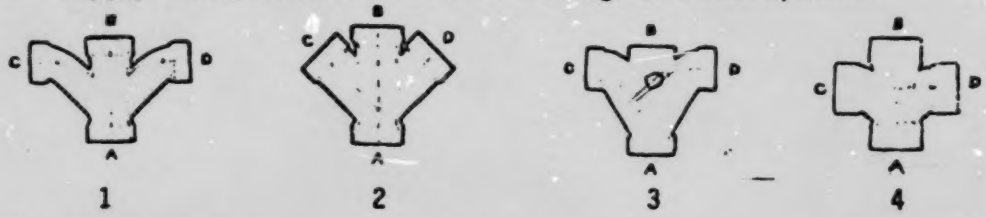
40. A 45 degree Long Turn Ell is illustrated by figure#:

a. 4.
b. 2.
c. 1.
d. 3.

73.01.01.09

41. What is the purpose of plastic branch fittings?

a. supply branches to a run in vent systems only.
b. supply branches to a run in a hot water system.
c. supply branches to a run in only drainage systems.
d. supply branches to a run in both drainage and vent systems.



42. Which of the figures shown above depicts a sanitary cross ?

a. #2.
b. #4.
c. #1.
d. #3.

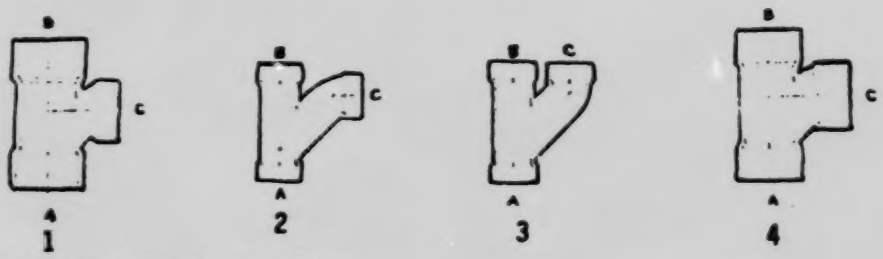
43. Identify figure #2.

a. double wye.
b. double long turn T-Y.
c. Sanitary cross with side inlet.
d. double short turn T-Y.

44. Which of the following correctly identifies item #1?

a. Sanitary cross with side inlet.
b. Double wye.
c. Double long turn T-Y.
d. Double short turn T-Y.

45. Identify figure#2.



a. short turn T-Y reducing (sanitary tee).
b. upturn wye.
c. short turn T-Y (sanitary tee).
d. long turn T-Y.

73.01.01.10

46. Which of the following plastic pipe fittings is used to adapt a pipe to the outlet of a water closet?

    a. Adapter.
    b. Bushing.
    c. Coupling.
    d. Closet flange.

47. The plastic pipe fitting which is used to reduce the size of the opening of a fitting is called:

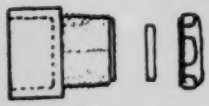
    a. a bushing.
    b. an adapter.
    c. a threaded plastic cap/plug.
    d. a closet flange.

48. Which of the following plastic pipe fittings is used to connect two lengths of pipe?

    a. Bushing.
    b. Coupling.
    c. Adapter.
    d. Closet flange.

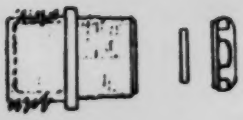
49. Identify the plastic fitting illustrated below:

    a. male trap adapter.
    b. female trap adapter.
    c. closet flange.
    d. spigot adapter.



50. Identify the plastic fitting illustrated below:

    a. clean out plug.
    b. male trap adapter.
    c. reducer coupling.
    d. fitting clean out adapter.



73.01.01.11

51. Long pipe specified as O.D. is larger than:

a. 8 inches.
b. 10 inches.
c. 12 inches.
d. 6 inches.

52. A length of long pipe is apparently being standardized at about:

a. 21 feet.
b. 15 feet.
c. 24 feet.
d. 18 feet.

53. In how many weights is long pipe available?

a. 2.
b. 3.
c. 5.
d. 8.

54. What is the shape and angle of a pipe thread?

a. V-shaped; 72 degrees.
b. Y-shaped; 45 degrees.
c. V-shaped; 60 degrees.
d. Y-shaped; 72 degrees.

55. Neglecting to apply cutting oil when threading a pipe will result in:

a. friction which may ruin the dies.
b. friction which may ruin the threads being cut into the pipe.
c. improperly threading the pipe; loss of thread sharpness.
d. dull threads.

73.01.01.12

56. If two outlets are placed 4'-6" apart, what is this measurement called?

a. face-to-face.
b. center-to-throat.
c. center-to-center.
d. center-to-back.

57. When making an end-to-center measurement, how many allowances must be made?

a. three fitting allowances.
b. two fitting allowances.
c. one fitting allowance.
d. four fitting allowances.

58. When making a center-to-center measurement, how many allowances must be made?

a. two fitting allowances.
b. four fitting allowances.
c. one fitting allowance.
d. three fitting allowances.

59. A 1½" pipe railing has seven posts 6'-6" center-to-center. Give the end-to-end length of pipe between the posts and the number of lengths.

a. 8'-3 2/3" end-to-end	four (4) lengths.
b. 6'-5 1/2" end-to-end	five (5) lengths.
c. 5"-10½" end-to-end	seven (7) lengths.
d. 6'-5 3/8" end-to-end	six (6) lengths.

REFER TO THE CHART ON THE NEXT PAGE FOR THE FOLLOWING QUESTION:

60. The thread engagement for a 1½" fitting is:

a. 13/16".
b. 9/16".
c. 5/8".
d. 11/16".

73.01.01.13

61. How many degrees are there in a circle?

a. 90 degrees.
b. 360 degrees.
c. 270 degrees.
d. 180 degrees.

62. Angles are measured by using a:

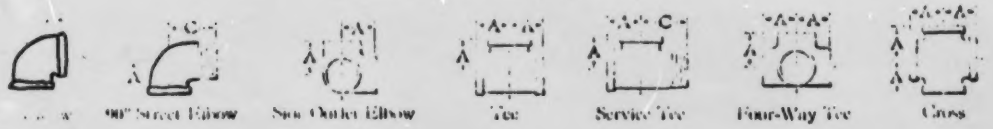
a. plumb bob.
b. straight rule.
c. protractor.
d. divider.

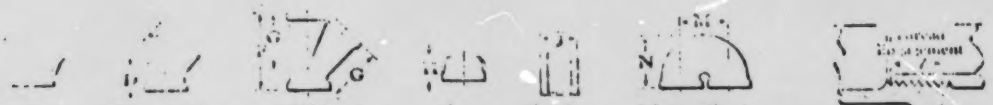
CHART FOR QUESTION 60 ON THE PRECEDING PAGE

150-Pound Malleable Iron Fittings

Dimensions of Straight Sizes, in Inches

Banded and Plain Pattern





These dimensions apply to both Banded and Plain Fittings; their center to end dimensions are alike.

*Close Pattern Return Bends can not be used to make up parallel coils. The center to center dimension is so close that the flanges of adjacent bends will not clear each other.

Size	A	B	C	D	E	F	G	H	J	Return Bends Close M	Close N	Medium M	Medium N	Open M	Open N	Z
⅛	1 1/16	½	1	1 11/16	1 5/16			9/16	15/16							⅛
¼	1 5/16	⅝	1 3/16	1 5/8	1 3/16			5/8	1 1/16							¼
⅜	1 5/16	1 3/16	1 7/16	1 11/16	1 1/16	2 1/8	1 7/16	⅝	1 3/16							⅜
½	1 5/8	⅞	1 5/8	1 13/16	1 3/16	2 7/16	1 11/16	⅝	1 3/16	1	1 3/4	1 1/4	1 5/8	1 1/2	1 7/8	½
¾	1 5/16	1	1 7/8	1 15/16	1 5/16	2 5/8	2	1 1/16	1 1/2	1 1/4	2 3/16	1 1/2	1 15/16	2	2 1/4	¾
1	1 1/2	1 1/8	2 1/8	2 1/16	1 1/2	3 3/8	2 7/16	1 5/16	1 11/16	1 1/2	2 1/2	1 7/8	2 1/4	2 1/2	2 5/8	1
1 ¼	1 3/4	1 5/16	2 3/16	1 1/4	1 11/16	4 1/16	2 15/16	1 1/4	1 15/16	1 3/4	2 13/16	2 1/4	2 13/16	3	3 3/16	1
1 ½	1 13/16	1 7/16	2 11/16	1 3/8	1 7/8	4 1/2	3 5/16	1 5/16	2 1/8	2 3/16	3 3/16	2 1/2	3 3/16	3 1/2	3 5/8	1
2	2 1/4	1 11/16	3 1/4	1 11/16	2 1/4	5 7/16	4	1 7/16	2 1/2	2 5/8	3 7/8	3	3 5/8	3	4 1/8	1
2 ½	2 11/16	1 15/16	3 13/16			6 1/4	4 11/16	1 13/16	2 7/8					4 1/2	4 13/16	1
3	3 1/16	2 1/16	3 5/8			7 1/4	5 5/16	1 15/16	3 1/16					5	5 5/16	1
3 ½	3 7/16	2 3/8						1 15/16								1
4	3 7/8	2 5/8	5 11/16			8 7/8	6 13/16	2 1/16	3 11/16					6	6 11/16	1
5	4 5/16	3 1/16						2 5/16								1
6	4 11/16	3 7/16						2 5/16								1

Normal Engagement

Between Male and Female Threads

Standard Taper Pipe Threads

Straight Type Dryseal Fitting Threads

Gaging Fitting Thread Assembly

Size of Pipe	D Length of Pipe Entering Recessed Gaging Fitting
⅛	⅛
¼	¼
⅜	⅜
½	½
¾	¾
1	1

Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14
A	¼	3/8	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1	1 1/16	1 1/8	1 1/4	1 5/16	1 7/16	1 5/8	1 7/8	2
B						9/16	⅝	⅝	⅝	⅞	15/16	1	1 1/16	1 3/16	1 1/4	1 3/8	1 9/16	1 11/16	1 7/8

63. When making an offset on a pipe line, a 45 degree elbow is used at the first bend. What fitting should be used for the second bend to return the pipe to its original axis?

a. 45 degree elbow.
b. 30 degree elbow.
c. 60 degree elbow.
d. 90 degree elbow.

64. In how many different angles are drainage pipe elbows available?

a. 9.
b. 7.
c. 5.
d. 6.

65. What is the center-to-center distance of a 4 inch wide pattern return bend?

a. 8"
b. 5"
c. 7"
d. 6"

73.01.01.14

66. Drainage tees range in sizes from:

a. 1½" to 12".
b. 1" to 9".
c. 1¼" to 8".
d. 1 1/8" to 7½".

67. Reducing drainage tees range from:

a. 1½" x 1¼" to 8" x 6".
b. 1" x 1½" to 7" x 5".
c. 1¼" x 1 1/8" to 7½" x 9".
d. 2" x 1 3/4" to 8" x 5½".

68. Which of the following types of drainage tees is used on vertical pipes?

a. short turn.
b. straight.
c. 30 degrees.
d. 45 degree.

69. Which of the following drainage tee patterns is permitted only on vent lines?

a. 60 degree.
b. short turn.
c. straight.
d. 30 degree.

70. Which outlet of a drainage tee is reduced?

a. The branch.
b. The top.
c. The bottom.
d. The bottom and the branch.

73.01.01.15

71. At what angle must branches always enter drains?

a. 60 degrees.
b. 30 degrees.
c. 45 degrees.
d. 90 degrees.

72. Which of the following is not a characteristic of drainage Y's?

a. Available in single patterns.
b. Available in reducing sizes.
c. Available in increasing sizes.
d. Available in double patterns.

73. If two branches were to go in opposite directions at the same floor level, what fitting should be used?

a. A single Tee.
b. A single Y.
c. A triple Y.
d. A double Y.

74. How many sizes are drainage ells made in?

a. 10
b. 6
c. 5
d. 7

75. How many angles are drainage ells made in?

a. 7
b. 5
c. 4
d. 9

73.01.02.01

76. What is the usual underground location of a public sewer?

a. Right side of the street.
b. Center of the street.
c. Left side of the street.
d. Criss-crosses the street from left to right.

77. Why are storm sewers made egg-shaped?

a. To prevent rapid flow of water.
b. To hold more water.
c. Self-cleansing, even with small flow.
d. Prevent pressure build up.

78. What is an outlet placed in a sewer called?

a. A slope.
b. A pitch up.
c. A slant.
d. A house trap.

79. Where is an outlet placed in order to keep it out of water in the sewer?

a. Above the center of the sewer---about 90 degree angle.
b. Even with the center of the sewer---about 90 degree angle.
c. Below the center of the sewer---about 60 degree angle.
d. Above the center of the sewer---about 45 degree angle.

80. What tool is used to determine the pitch of drain pipes?

a. Plumb bob.
b. Level.
c. Straight rule.
d. Tape measure.

73.01.02.02

81. Approximately how much grade does a drain pipe have and in which direction?

a. 1/8" per foot toward the sewer.
b. ½" per foot away from the sewer.
c. ¼" per foot toward the sewer.
d. 3/4" per foot away from the sewer.

82. How can you determine when a surface is level?

a. The level will have the air bubble in the right portion of the glass.
b. The level will have the air bubble in the left portion of the glass.
c. The level will have the air bubble in the center of the glass.
d. The air bubble will not be visible in the glass.

83. If the level is 18 inches long and the pitch is ¼" per foot, how thick a block should be placed under the level?

a. 5/8" block.
b. 3/4" block.
c. 1/8" block.
d. 3/8" block.

84. If a level is placed on top of a pipe, under which end is the block placed?

a. Under the lower end.
b. Above the lower end.
c. Under the upper end.
d. Above the upper end.

85. All the air in a hot water heating system will pass up to the radiators if the pipe:

a. is level.
b. is graded up.
c. is graded down.
d. is set at any position.

73.01.02.03

REFER TO THE FOLLOWING CHARTS AND TABLES ON THE FOLLOWING PAGES AS THEY APPLY TO THE FOLLOWING 4 QUESTIONS:

86. Upon what is the fixture-unit based?

a. The discharge of a bathtub=2 cubic feet per minute.
b. The discharge of a bathroom group-8 cubic feet per minute.
c. The discharge of a lavatory-1 cubic foot per minute.
d. The discharge of a sink-3 cubic feet per minute.

REFER TO THESE CHARTS FOR THE QUESTIONS NUMBERS 86, 87, 88, and 89.

Fixture Units Per Fixture Or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Bathroom group - 1 toilet, 1 lavatory, 1 bathtub	8			4"
Bathtub	2	4	1 1/2"	1 1/2"
Shower over tub	3	6	2"	2"
Bedpan washer		10	3"	3"
Bidet	2	4	1 1/2"	1 1/2"
Comb. sink and tray	3		1 1/2"	1 1/2"
Dental cuspidor		1	1 1/4"	1 1/4"
Dental lavatory	1	2	1 1/4"	1 1/4"
Drinking fountain		1/2	1 1/4"	1 1/4"
Dishwasher	2	4	1 1/2"	
Kitchen sink, 1 1/2" outlet	2	4	1 1/2"	
Kitchen sink, 2" outlet		5	2"	
Lavatory	1	2	1 1/4" or 1 1/2"	
Lavatory, beauty parlor		3	1 1/2"	
Laundry tray, 1 or 2 part	2	4	1 1/2"	
Shower, each head	2	4	2"	
Sink, surgeon's		3	1 1/2"	
Sink, soda fountain, bar		2	1 1/4"	

Table of Pipe Sizes

Diameter of Pipe (inches)	Maximum Number of Fixture Units That May be Connected to-							
	Building Drain of Sewer Fall per Foot				1 Horizontal Branch	Not Over 3 Branch Intervals	Stacks With 3 or more Branch intervals	
	1/16"	1/8"	1/4"	1/2"			In 1 Branch Interval	Total in Stack
1	2	3	4	5	6	7	8	9
1 1/4					1	2	1	2
1 1/2					3	4	2	8
2			21	26	6	10	6	24
2 1/2			24	31	12	20	9	42
3			* 27	*36	*20	30	11	60
4		180	216	250	160	240	90	500
5		390	480	575	360	540	200	1,100
6		700	840	1,000	620	960	350	1,900
8	1,400	1,600	1,920	2,300	1,400	2,200	600	3,600
10	2,500	2,900	3,500	4,200	2,500	3,800	1,000	5,600
12	3,900	4,600	5,600	6,700	3,900	6,000	1,500	8,400
15	7,000	8,300	10,000	12,000	7,000			

REFER TO THIS CHART FOR THE QUESTIONS NUMBERS 86, 87, 88, 89:

Fixture Units Per Fixture or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Sink, flushing rim F.V.		10	3"	
Sink, service (trap stand)		3	3"	
Sink, service		3	1 1/2"	
Sink, pot or scullery		4	1 1/2"	
Urinal pedestal		10	3"	
Urinal (wall lip)		5	1 1/2"	
Urinal stall		5	2"	
Wash sink (each set of faucets)		2	1 1/2"	
Water closet	6	12	3"	

87. What is the size of the trap of a fixture rated as one fixture unit?

a. 3".
b. 2".
c. 1¼".
d. 1½".

88. What is the size of the trap and waste pipe of a bathtub?

a. 1¼" trap and 1½" drain.
b. 2" trap and 2" drain.
c. 3" trap and 3" drain.
d. 1½" trap and 1½" drain.

89. What is the fixture unit rate for a toilet in a private home?

a. 6 fixture units.
b. 5 fixture units.
c. 7 fixture units.
d. 8 fixture units.

90. What is the total fixture units which may be drained by a 4" stack with three branch intervals?

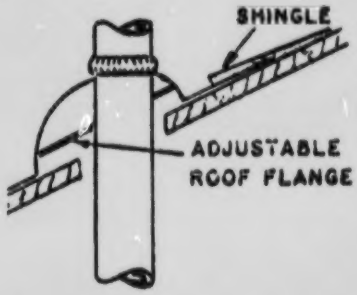
a. 30 fixture units.
b. 540 fixture units.
c. 240 fixture units.
d. 960 fixture units.

73.01.02.04

91. Name the three metals used for roof flanges:

a. copper, aluminum, and bronze.
b. galvanized sheet steel, copper and lead.
c. nickel, lead, and galvanized sheet steel.
d. aluminum-magnesium alloy, lead, and nickel.

92. How could the roof flange in the illustration below be made watertight?



a. Use any non-flexible cement.
b. Use lead caulk.
c. Use a roof flange gasket.
d. Use bituminous roof cement.

93. What is the formula for determining the capacity of fittings?

a. C=ABL.
b. C=KD2.
c. C=R2.
d. W=LH.

94. If a 2" stack was to be run in a Canadian city, how should the top of the stack be handled?

a. The top of the stack must be increased to prevent closing by frost.
b. The top of the stack would have to be filtered due to strict air pollution laws.
c. The top of the stack would have to be connected to a burning device to burn off any combustible fumes still remaining.
d. The top of the stack would have to be decreased in size due to the danger of frosting closed.

95. What kind of fittings must be used on a stack constructed of galvanized wrought iron?

a. DWV drainage fittings.
b. Copper drainage fittings.
c. Cast iron recessed drainage fittings.
d. Galvanized recessed drainage fittings.

73.01.02.05

96. What is meant by the terms "small fixture"?

a. Any plumbing fixture except sinks.
b. Any plumbing fixture except bathtubs.
c. Any plumbing fixture.
d. Any plumbing fixture except toilets.

97. Why is it necessary to have an equal air pressure in all parts of a drainage system?

a. To maintain the trap seals.
b. To prevent blockage or obstructions.
c. To increase the rate of flow.
d. To decrease the rate of flow.

98. How would the lack of proper venting affect a metal pipe in a drainage system?

a. Moisture clinging to the inside of a horizontal pipe absorbs corrosive gases. Proper ventilation would eliminate these gases.
b. There would be an improper amount of atmospheric pressure throughout the system, thereby affecting the rate of fluid and waste flow.
c. There would be an imbalance in the atmospheric pressure in the pipes, thereby causing the weakest portions of the systems (joints) to break.
d. The affects of improper ventilation would be so minimal that very little could be noticed.

99. At what angle should a branch waste pipe enter a main drain?

a. 30 degrees.
b. 45 degrees.
c. 90 degrees.
d. 60 degrees.

100. Which of the following types of branch soil or waste pipes should be laid on a board to prevent sagging?

a. Wrought iron.
b. Cast iron.
c. Brass.
d. Lead.

73.01.02.06

101. What is the usual size seal for a soil pipe trap?

a. 3".
b. 5".
c. 7".
d. 9".

102. Which of the following is an advantage of a cast iron trap over a terra cotta trap?

a. Has to be set 10 feet away from any building.
b. Weighs less.
c. Joints do not break.
d. Simpler to install.

103. Why should the fresh air inlet of a trap inside a basement be kept 10 feet from a window?

a. Sewage odors may enter the building.
b. Prevent excessive accumulation of moisture.
c. Prevent the installation of the house trap from being in error.
d. Prevent damage to the building's foundation in case of pressure build-up in the sewage system.

104. What is a safe depth of seal for a trap?

a. 3½" to 3 3/4".
b. 6" to 8".
c. 3/4" to 1".
d. 2½" to 4".

105. What may occur if gasoline gets into a public sewer?

a. An explosion.
b. Nothing.
c. The sewer will become clogged.
d. Excessive corrosion.

73.01.02.07

106. Which of the following types of pipe cannot be used for venting?

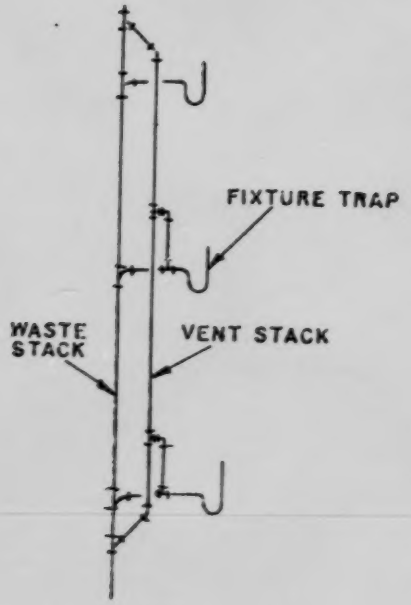
a. Steel.
b. Copper.
c. Lead.
d. Galvanized iron.

107. How high should a branch vent be placed?

a. 8" above the flood rim of the fixture it serves.
b. 6" above the flood rim of the fixture it serves.
c. 12" above the flood rim of the fixture it serves.
d. 4" above the flood rim of the fixture it serves.

108. What size pipe is required for the waste and vent stacks in the illustration on the following page.

a. 2" waste stack and a 1½" vent stack.
b. 3" waste stack and a 2" vent stack.
c. 1" waste stack and a ½" vent stack.
d. 2½" waste stack and a 3" vent stack.



109. What is another term for a continuous vent?

a. Anti-back pressure vent.
b. Trap vent.
c. Anti-siphon vent.
d. Back vent.

110. Which of the following pipe fittings is <u>not</u> recommended for use in a vent stack?

a. Short turn drainage TY.
b. Long turn drainage TY.
c. Single drainage TY.
d. Double drainage TY.

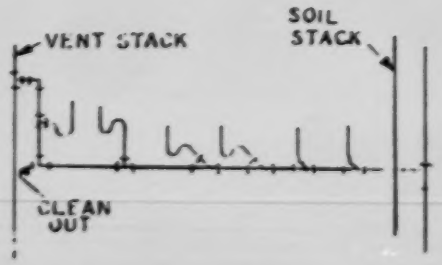
<u>73.01.02.08</u>

111. What is the purpose of a relief vent?

a. To relieve air pressure on branch waste near the stack.
b. To increase the air pressure on branch waste near the stack.
c. To decrease the rate of fluid flow.
d. To create a partial vacuum in the branch vent near the stack.

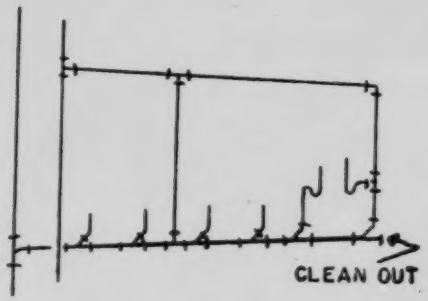
112. What type of vent is illustrated below?

a. Loop vent.
b. Yoke vent.
c. Circuit vent.
d. Relief vent.



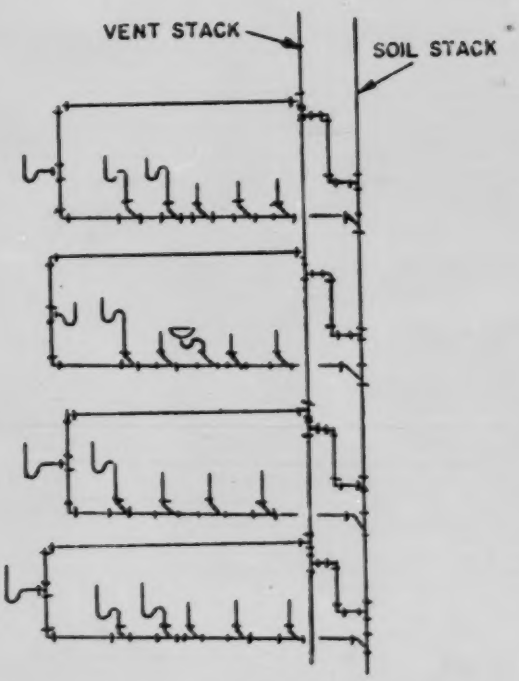
113. What type of vent is depicted by the illustration below?

a. Yoke vent.
b. Relief vent.
c. Loop vent.
d. Circuit vent.



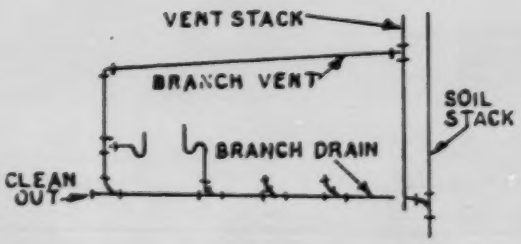
114. What type of vent is illustrated below?

a. Yoke vent.
b. Relief vent.
c. Loop vent.
d. Circuit vent.



115. What type of vent is illustrated below?

a. Loop vent.
b. Circuit vent.
c. Relief vent.
d. Yoke vent.



73.01.02.09

116. Which of the following rain leader installations is better and more efficient than the other? Why?

a. Figure 2 is better installation because of the expansion joint.
b. Figure 1 is better because it is less expensive to install.
c. Figure 1 is more efficient because of its wiped joints.
d. Figure 2 is the better installation because of its strainer.

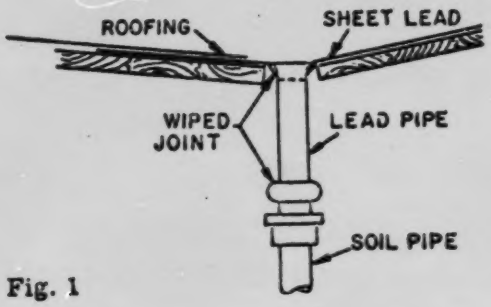


Fig. 1

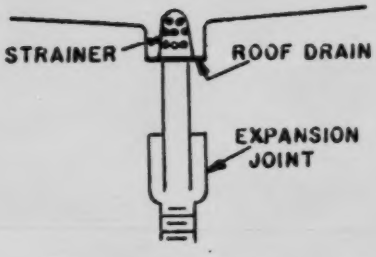


Fig. 2

117. Outside rain leaders above ground that discharge at the curb are usually constructed of:

a. cast iron.
b. galvanized steel.
c. wrought iron.
d. copper.

118. Who usually installs outside leaders above ground?

a. Building architect.
b. Roofing contractor.
c. plumber.
d. house owner.

73.01.02.12

131. Floor drains are constructed of:

a. brass.
b. galvanized steel.
c. cast iron.
d. wrought iron.

132. Which of the following is placed in a window well, driveway or any paved surface to carry away rain water?

a. Floor drain.
b. House drain.
c. Area drain.
d. Main house trap.

133. What size pipe would drain an area 10' wide x 100' long?

a. 5".
b. 3".
c. 4".
d. 6".

134. What must be placed on every pipe to a floor drain?

a. A 90 degree wye.
b. A centifugal pump.
c. A trap.
d. A short turn TY.

135. How could evaporation in a drain pipe of a floor drain be prevented?

a. By placing a water faucet close by.
b. Keeping it covered.
c. Keeping it lubricated.
d. Keeping a constant flow of water through it.

73.01.02.13

136. Which of the following "clogs" is the worst to remove from fixture traps or waste pipes?

a. Hair.
b. Grease.
c. Lint.
d. Miscellaneous articles.

137. What fixture is usually stopped by hair?

a. Toilet.
b. Lavatory.
c. Laundry tub.
d. Utility sink.

138. How should a lead pencil be removed from a toilet bowl?

a. Closet auger.
b. Coil wire with cutting head.
c. Power driven coil wire.
d. Bent wire.

139. Which of the following drain components is most likely to be clogged with grease?

a. Soil stack.
b. Main house trap.
c. Sink waste pipe.
d. Laundry tub.

140. Which of the following cleaning tools should be used on a toilet?

a. Closet auger.
b. Grappler.
c. Plunger.
d. Coil head wire.

COURSE PRETEST ANSWER KEY

Occupational Area:
File Code: 73.01.00.00.A2-2
Name:

ANSWERS

73.01.01.01	1. B		73.01.01.05	21. A		73.01.01.09	41. D
	2. C			22. D			42. B
	3. C			23. C			43. A
	4. B			24. C			44. C
	5. D			25. D			45. D
73.01.01.02	6. A		73.01.01.06	26. A		73.01.01.10	46. D
	7. D			27. D			47. A
	8. A			28. C			48. B
	9. A			29. C			49. B
	10. D			30. D			50. B
73.01.01.03	11. D		73.01.01.07	31. A		73.01.01.11	51. C
	12. B			32. D			52. A
	13. D			33. C			53. B
	14. B			34. C			54. C
	15. B			35. A			55. A
73.01.01.04	16. B		73.01.01.08	36. C		73.01.01.12	56. C
	17. C			37. B			57. C
	18. C			38. A			58. A
	19. B			39. C			59. D
	20. D			40. B			60. D

COURSE PRETEST ANSWER KEY

Occupational Area: _____
File Code: 73.01.00.00.A2-2
Name: _____

ANSWERS

3.01.01.13	61. B _____	73.01.02.02	81. C _____	73.01.02.06	101. A _____
	62. C _____		82. C _____		102. C _____
	63. A _____		83. D _____		103. A _____
	64. B _____		84. A _____		104. D _____
	65. D _____		85. B _____		105. A _____
73.01.01.14	66. C _____	73.01.02.03	86. C _____	73.01.02.07	106. A _____
	67. A _____		87. C _____		107. B _____
	68. A _____		88. D _____		108. A _____
	69. C _____		89. A _____		109. D _____
	70. A _____		90. C _____		110. B _____
73.01.01.15	71. C _____	73.01.02.04	91. B _____	73.01.02.08	111. A _____
	72. C _____		92. D _____		112. C _____
	73. D _____		93. B _____		113. B _____
	74. A _____		94. A _____		114. A _____
	75. A _____		95. D _____		115. A _____
73.01.02.01	76. B _____	73.01.02.05	96. D _____	73.01.02.09	116. A _____
	77. C _____		97. A _____		117. C _____
	78. C _____		98. A _____		118. B _____
	79. D _____		99. B _____		119. B _____
	80. B _____		100. D _____		120. D _____

COURSE PRETEST ANSWER KEY

Occupational Area: _____
File Code: 73.01.00.00 A2-2
Name: _____

ANSWERS

73.01.02.10	121. A_____	141. _____	161. _____
	122. B_____	142. _____	162. _____
	123. C_____	143. _____	163. _____
	124. A_____	144. _____	164. _____
	125. C_____	145. _____	165. _____
73.01.02.11	126. D_____	146. _____	166. _____
	127. D_____	147. _____	167. _____
	128. C_____	148. _____	168. _____
	129. A_____	149. _____	169. _____
	130. B_____	150. _____	170. _____
73.01.02.12	131. C_____	151. _____	171. _____
	132. C_____	152. _____	172. _____
	133. C_____	153. _____	173. _____
	134. C_____	154. _____	174. _____
	135. A_____	155. _____	175. _____
73.01.02.13	136. B_____	156. _____	176. _____
	137. B_____	157. _____	177. _____
	138. A_____	158. _____	178. _____
	139. C_____	159. _____	179. _____
	140. A_____	160. _____	180. _____

RESOURCE LIST

Printed Materials

1. Montana State Plumbing Code.
2. Plumbers and Pipe Fitters Library: Materials, Tools, Calculations, Volume 1. Jules Oravetz, Sr., Theodore Audel and Company, 1967.
3. Related Information Plumbing 1. Harry Slater, Delmar Publishers, 1958.
4. Related Information Plumbing 2. Harry Slater, Delmar Publishers, 1959.

Audio/Visuals

none

Equipment

1. Chisel, cold.
2. Cutter, pipe, plastic.
3. Cutter, pipe, soil.
4. Furnace, lead, melting.
5. Hard hat.
6. Irons, caulking.
7. Irons, yarning.
8. Joint runner, asbestos.
9. Ladle, lead handling.
10. Pipe puller for hub type soil pipe.
11. Plugs, test (assortment).
12. Pot, lead.
13. Reamer.
14. Threader/Reamer/Cutter, pipe, power combination.
15. Tools, basic (plumber):
    - bit, drill (set) (1/16 to 1/4 inch)
    - box, tool
    - chalk line
    - cutter, tubing (imp, and 1/8 to 5/8 inch)
    - flaring tool
    - hacksaw
    - hammer, claw (16 oz.)
    - plier, channel lock
    - plumb bob
    - rule, steel (12 ft.)
    - screwdriver (4 in one)
    - square, combination (12 inch)
    - wrench, Allen (set)
    - wrench, open-end, adjustable (6 and 8 inch)
    - wrench, open-end/box, combination (3/8 to 3/4 inch)
    - wrench, pipe (12 inch)
16. Vice, pipe.
17. Wrench, pipe (14, 18, 24 and 36 inch)
18. Wrench, torque.

FOLLOW-THROUGH:

Go to the first assigned Unit Learning Experience Guide (LEG) listed on your Student Progress Record (SPR).

RESOURCES:

A resource list is attached.

GENERAL INSTRUCTIONS:

This course has two units. Each unit has a Unit Learning Experience Guide (LEG) that gives directions for unit completion. Each unit consists of Learning Activity Packages (LAPs) that provide specific information for completion of a learning activity. Pretesting results direct the student to units and performance activities.

The general procedure for this course is as follows:

(1) Read the assigned unit LEG for this course.
(2) Begin and complete the first assigned LAP.
    a. Take and score the LAP test.
    b. Turn in the LAP test answer sheet.
    c. Determine the reason for any missed items on the LAP test.
    d. Proceed to the next assigned LAP in the unit.
    e. Complete all required LAPs for the unit by following steps (a) through (d).
(3) Take the unit tests as described in the Unit LEG "Evaluation Procedures".
(4) Proceed to the next assigned unit in this course.
(5) Follow steps 1 through 4 for all required units for this course.
(6) Proceed to the next assigned course..

You will work independently unless directed to do otherwise. When questions or problems arise, you are expected to discuss them with the instructor. At all times remember to follow correct safety procedures during the performance activity.

UNIT TITLES:

.01 Pipe and Fittings Assembly
.02 Planning, Layout and Assembly

EVALUATION PROCEDURE:

Course evaluation is by pre and post testing using a multiple-choice type of test.

In this course, the course test is used as a pretest to determine which units, if any, the student may be able to validate. The student is considered validated for a particular unit if 4 out of 5 items are correctly answered for each LAP part on the course pretest and that particular unit does not have a performance test requirement.

For those units with performance test requirements, the student must also satisfactorily complete the performance test to validate that unit. Unit performance test validation procedures are given in the "Evaluation Procedure" section of the unit Learning Experience Guide (LEG).

The course test will also be taken by the student as a post test to determine any changed resulting from taking all or part of the course.

File Code: 73.01.01.00.A2-1

Date Published: 6/30/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Experience Guide

UNIT: PIPE AND FITTINGS ASSEMBLY

RATIONALE:

When an assignment is given to a plumber, there are several things that must be done. Those things to be done include:

1. Determining and obtaining the tools and equipment needed to do the task.
2. Determining the size and type of materials needed and obtaining them.
3. Determining the procedures for and doing the cutting, fitting and assembling of materials for the task.

The activities in this unit are planned to have the student acquire the skills needed to do the above listed things for pipe and fittings assembly in drainage applications.

PREREQUISITES:

The course prerequisites.

OBJECTIVES:

Prepare and join drainage, waste and vent assemblies and steel pipe assemblies according to specifications using appropriate tools, equipment and materials.

RESOURCES:

Printed Material

Montana State Plumbing Code.
Plumbers and Pipe Fitters Library: Materials, Tools, Calculations, Volume 1. Jules Oravetz, Sr., Theodore Audel and Company, 1967.
Related Information Plumbing 1. Harry Slater, Delmar Publishers, 1958.
Related Information Plumbing 2. Harry Slater, Delmar Publishers, 1959.

Equipment

Chisel, cold.
Cutter, pipe, plastic.
Cutter, pipe, soil.
Furnace, lead, melting.
Irons, caulking.
Irons, yarning.
Joint runner, asbestos.

Principal Author(s):

Ted Bundy

RESOURCES: Equipment (cont.)

Ladle, lead handling.
Pipe puller for hub type soil pipe.
Pot, lead.
Ropes, lead running.
Threader/Reamer/Cutter, pipe, power combination.
Tools, basic (plumber): bit, drill (set) (1/6 to 1/4 inch)
box, tool
chalk line
cutter, tubing (1/8 to 5/8 inch)
flaring tool
hacksaw
hammer, claw (16 oz.)
plier, channel lock
rule, steel (12 ft.)
screwdriver (4 in one)
square, combination (12 inch)
wrench, Allen (set)
wrench, open-end, adjustable (6 and 8 inch)
wrench, open-end/box, combination (3/8 to 3/4 inch)
wrench, pipe (12 inch)
Vice, pipe.
Wrench, pipe (14, 18, 24 and 36 inch).
Wrench, torque.

GENERAL INSTRUCTIONS:

This unit consists of fifteen Learning Activity Packages (LAPs). Each LAP will provide specific information for completion of a learning activity.

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.
(3) Take and score the LAP test.
(4) Turn in the LAP test answer sheet.
(5) Determine the reason for any missed items on the LAP test.
(6) Proceed to and complete the next assigned LAP in the unit.
(7) Complete all required LAPs for the unit by following steps 3 through 6.
(8) In this Unit, there are some LAPs that have tests combined with other LAP tests. These combined tests are taken after completing the last LAP covered by the test.
(9) Take the unit tests as described in the Unit LEG "Evaluation Procedures".
(10) Proceed to the next assigned unit.

PERFORMANCE ACTIVITIES:

.01 Soil Pipe Nomenclature and Cutting
.02 Joining Soil Pipe and Fittings
.03 Soil Pipe Bends, Wyes and Combinations
.04 Soil Pipe Tees and Offsets
.05 Miscellaneous Soil Pipe Fittings
.06 Pipe Hanger Applications
.07 Plastic Pipe Nomenclature and Cutting
.08 Plastic Angle Fittings
.09 Plastic Branch Fittings
.10 Miscellaneous Plastic Fittings
.11 Pipe Nomenclature, Function and Threading
.12 Pipe Measurement, Layout and Assembly
.13 Drainage Angle Fitting Nomenclature, Function and Assembly
.14 Drainage Tee Nomenclature, Function and Assembly
.15 Drainage Wye Nomenclature, Function and Assembly

EVALUATION PROCEDURE:

When pretesting:

1. The student takes the unit multiple-choice pretest.
2. Successful completion is 4 out of 5 items for each LAP part of the pretest.
3. The student then takes a unit performance test if the unit pretest was successfully completed.
4. Satisfactory completion of the performance test is meeting the criteria listed on the performance test.

When post testing:

1. The student takes a multiple-choice unit post test and a unit performance test.
2. Successful unit completion is meeting the listed criteria for the performance test.

FOLLOW-THROUGH:

Go to the first assigned Learning Activity Package (LAP) listed on your Student Progress Record (SPR).

Student: _____ File Code: 73.01.01.00.A2-2

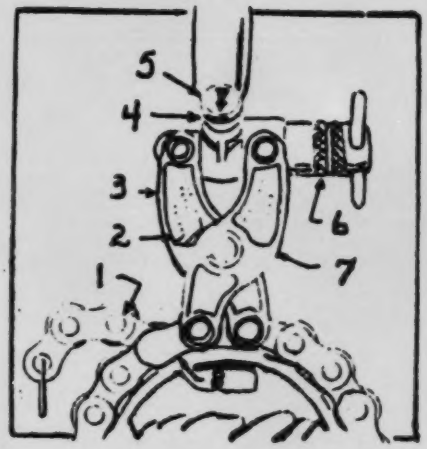
Date: _____ Date Published: 10/23/74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

UNIT PRETEST: PIPE AND FITTINGS ASSEMBLY

73.01.01.01

THE FOLLOWING ILLUSTRATION IS PROVIDED FOR THE NEXT 5 QUESTIONS:



1. Identify item #3:

   a. inner side arm.
   b. outer side arm.
   c. hook.
   d. ratchet knob.

2. Identify item #4.

   a. ratchet knob.
   b. ratchet pin.
   c. adjusting knob.
   d. chain pin.

3. Identify item #5.

   a. adjusting knob.
   b. ratchet pin.
   c. ratchet knob.
   d. chain pin.

4. Identify item #7.

   a. adjusting knob.
   b. inner side arm.
   c. marks.
   d. outer side arm.

5. Identify item #8.

   a. ratchet pin.
   b. chain pin.
   c. hook.
   d. adjusting knob.

73.01.01.02

6. What are the two methods used to join hub type soil pipes and fittings?

   a. caulked lead and hub gasket.
   b. hub gasket and cementing.
   c. welding and caulked lead.
   d. hub gasket and welding.

7. Lead caulked joints are usually the easiest to make when pipes are in which of the following positions?

   a. Vertical.
   b. Horizontal.
   c. Diagonal.
   d. Either the horizontal or vertical.

8. Why is oakum used around pipe fittings?

   a. To provide support for the fittings.
   b. To simply take up space, thereby saving on the amount of lead used.
   c. To provide a cushion for the fittings; absorbs underground shocks.
   d. To help waterproof the joints.

9. What is oakum?

   a. a flexible lead bead.
   b. Old hemp rope soaked in oil.
   c. Oil soaked rags.
   d. Insulation.

10. What is the purpose of using a joint runner when making a lead joint in the horizontal position?

   a. To provide extra support for the joint.
   b. To provide insulation for the joint against the heat of the molten lead.
   c. To retain the molten lead around the joint.
   d. To decrease the amount of time needed to cool the molten lead.

73.01.01.03

11. What type of soil pipe bend is used to connect the toilet to the waste system?

   a. Return bend.
   b. Closet bend.
   c. Closet flange.
   d. Bend with cleanout.

12. Which of the following items is used to attach the water closet to the closet bend?

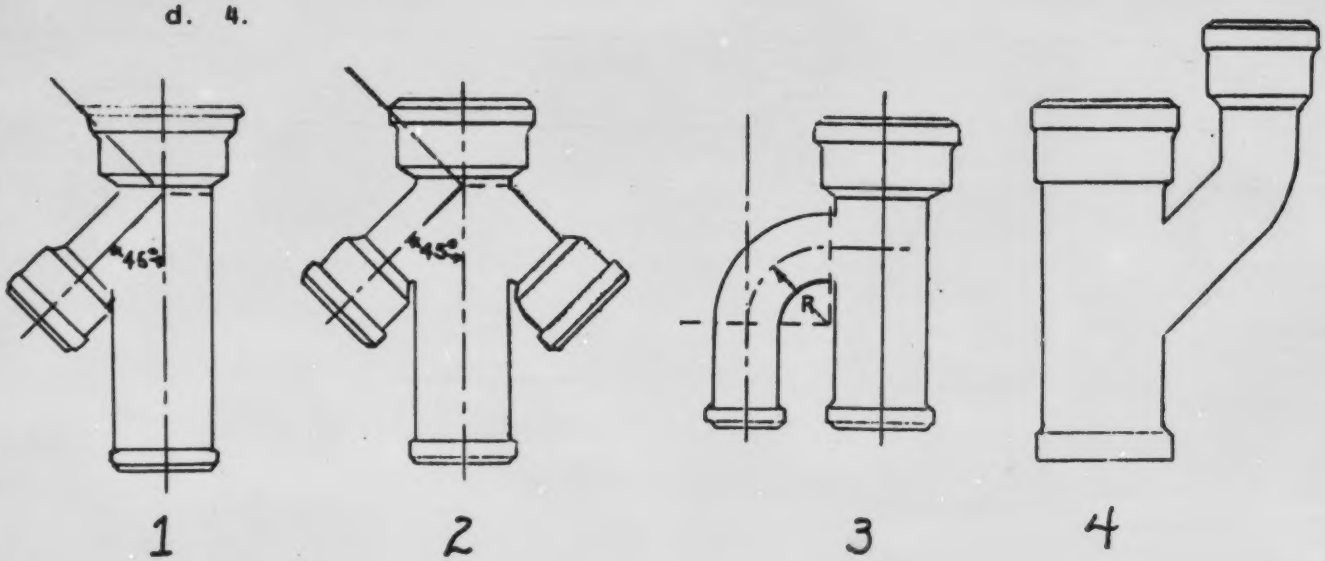
    a. Bend with cleanout.
    b. Another closet bend.
    c. Closet flange.
    d. Return bend.

13. A combination wye and 1/8 bend can be substituted for:

    a. a ¼ bend and a double inverted wye branch.
    b. a 1/8 bend and a wye branch.
    c. a 1/8 bend and a single inverted wye branch.
    d. a ¼ bend and a wye branch.

14. A single inverted wye branch is illustrated by which of the following figures?

    a. 2.
    b. 1.
    c. 3.
    d. 4.



15. In degrees, a quarter bend is 1/4 of 360 degrees or:

    a. 90 degrees.
    b. 80 degrees.
    c. 45 degrees.
    d. 180 degrees.

73.01.01.04

FOR THE NEXT 5 QUESTIONS REFER TO THE CHARTS ON THE FOLLOWING PAGES:

See page 6a also

16. What is the overall length of a 5" x 6" 45 degree offset?

    a. 16½".
    b. 18½".
    c. 5 9/16".
    d. 14½".

17. What is the laying length of a 2" x 8" 45 degree offset?

    a. 13¼".
    b. 13 3/4".
    c. 15 3/4".
    d. 11¼".

18. What is the overall length of a 4" x 6" 60 degree offset?

    a. Cannot be determined from charts provided.
    b. 16".
    c. 18".
    d. 24".

19. Dimension "H" on a 6" x 2" 45 degree offset is:

    a. 2 3/8".
    b. 5 5/8".
    c. 4".
    d. 6".

20. What is the vertical distance between centers of a 4" x 8" medium 45 degree offset?

    a. 10".
    b. 9½".
    c. 14".
    d. 8 3/4".

73.01.01.05

21. Which of the following soil pipe fittings is used to join a threaded pipe to a soil pipe hub?

    a. Caulking sleeve.
    b. Vent cowl.
    c. Backwater valve.
    d. Pipe increaser.

CHARTS FOR QUESTIONS NUMBERS 16, 17, 18, 19, and 20.

2-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X[1]	WGT
2×2	2 3/4	3 1/2	3 1/2	4 1/4	9 3/4	2	2	2	7 1/4	5
2×4	2 3/4	3 1/2	3 1/2	4 1/4	11 3/4	4	4	2	9 1/4	6
2×6	2 3/4	3 1/2	3 1/2	4 1/4	13 3/4	6	6	2	11 1/4	8
2×8	2 3/4	3 1/2	3 1/2	4 1/4	15 3/4	8	8	2	13 1/4	9

3-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X[1]	WGT
3×2	3 1/4	4	4 1/4	5	11 1/4	2	2	2 1/2	8 1/2	10
3×4	3 1/4	4	4 1/4	5	13 1/4	4	4	2 1/2	10 1/2	12
3×6	3 1/4	4	4 1/4	5	15 1/4	6	6	2 1/2	12 1/2	14
3×8	3 1/4	4	4 1/4	5	17 1/4	8	8	2 1/2	14 1/2	16

4-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X[1]	WGT
4×2	3 1/2	4	4 3/4	5 1/4	12	2	2	3	9	14
4×4	3 1/2	4	4 3/4	5 1/4	14	4	4	3	11	16
4×6	3 1/2	4	4 3/4	5 1/4	16	6	6	3	13	19
4×8	3 1/2	4	4 3/4	5 1/4	18	8	8	3	15	21

CHARTS FOR QUESTIONS NUMBERS 16, 17, 18, 19, and 20.
See Page 6a also

5-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
5 × 2	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$12\frac{1}{2}$	2	2	$3\frac{1}{2}$	$9\frac{1}{2}$	17
5 × 4	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$14\frac{1}{2}$	4	4	$3\frac{1}{2}$	$11\frac{1}{2}$	21
5 × 6	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$16\frac{1}{2}$	6	6	$3\frac{1}{2}$	$13\frac{1}{2}$	24
5 × 8	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$18\frac{1}{2}$	8	8	$3\frac{1}{2}$	$15\frac{1}{2}$	27

6-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
6 × 2	$3\frac{1}{2}$	$4\frac{1}{8}$	5	$5\frac{5}{8}$	13	$2\frac{3}{8}$	2	4	10	21
6 × 4	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	15	4	4	4	12	25
6 × 6	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	17	6	6	4	14	28
6 × 8	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	19	8	8	4	16	32

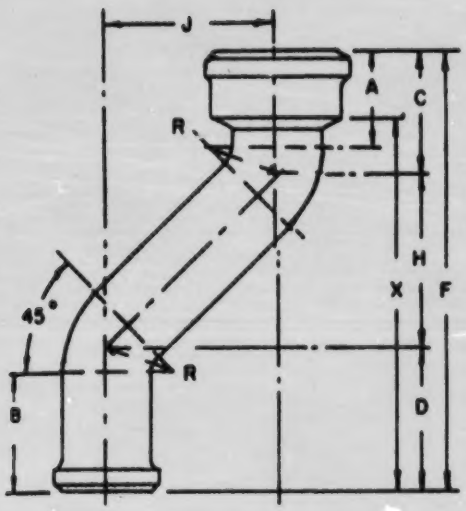
22. Which of the following soil pipe fittings is used to prevent sewage from flowing back into the system?

    a. Vent cowl.
    b. Insertable joint.
    c. Backwater valve.
    d. Pipe reducer.

23. A pipe increaser is used to:

    a. enlarge the vent opening in cold climates to prevent it from frosting closed.
    b. prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
    c. decrease the size of large drains when the capacity of the system changes.
    d. join a threaded pipe to a soil pipe hub.

Illustration for Questions Numbers 16, 17, 18, 19 and 20.

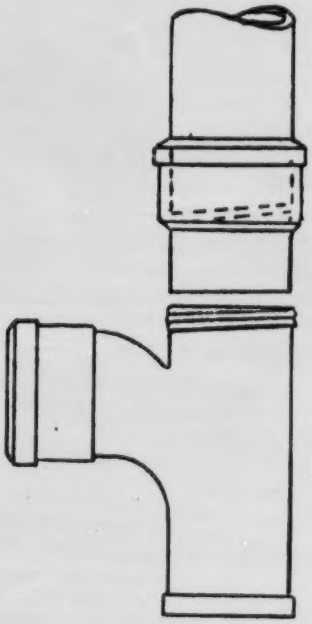


24. A vent cowl is used for which of the following purposes?

    a. Decrease the size of large drains when the capacity of the system changes.
    b. Enlarge the vent opening in cold climates to prevent it from frosting closed.
    c. Prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
    d. Join a threaded pipe to a soil pipe hub.

25. Which of the following special soil pipe fittings is illustrated below?

    a. Sisson insertable joint.
    b. Kaffer tee.
    c. Backwater valve.
    d. Caulking sleeve.



73.01.01.06

26. Which of the following pipe supports should be used to hang a 4" line of wrought iron pipe?

    a. Reznor hook.
    b. Split ring hanger.
    c. Coil hanger.
    d. Clevis hanger.

27. Which of the following securing devices should be used to fasten a clevis hanger to a wood joist?

    a. Lag bolt.
    b. Lag screw.
    c. 8d finish nail.
    d. Molly screw.

28. If a 3/4" lag screw is to be put into a wooden joist, what size hole should be bored?

    a. About 1/4".
    b. 3/4".
    c. About 3/8".
    d. About 5/8".

29. Which of the following hanger fastenings should be used to secure a hanger to a steel I-beam?

    a. A beam clamp.
    b. Lag screw.
    c. Lag bolt.
    d. Concrete insert.

30. What tool should be used to cut a hole in a brick wall?

    a. Sabre saw.
    b. Coping saw.
    c. Keyhole saw.
    d. Star drill.

73.01.01.07

31. What is the safe working pressure of 1¼" standard plastic pipe?

    a. 200 lbs.
    b. 250 lbs.
    c. 300 lbs.
    d. 350 lbs.

32. Would it be possible to lift 100,000 pounds of steel with a 1" x 1" plastic bar?

    a. Possibly.
    b. Yes.
    c. Definitely not.
    d. Occasionally.

33. Plastic pipe cannot be used for circulating pipes because:

a. It cannot adapt or join the steel fittings.
b. It cannot withstand the pressure.
c. It cannot withstand the temperature.
d. It is not manufactured in the proper size for this purpose.

34. Which of the following disadvantages is the greatest for plastic pipe?

a. Will not stand pressures over 100 to 200 lbs per square inch.
b. Cannot withstand temperatuers over 150 degrees Fahrenheit.
c. Poor expansion and contraction rate.
d. Expensive.

35. Which of the following tools should a plumber use to cut plastic pipe?

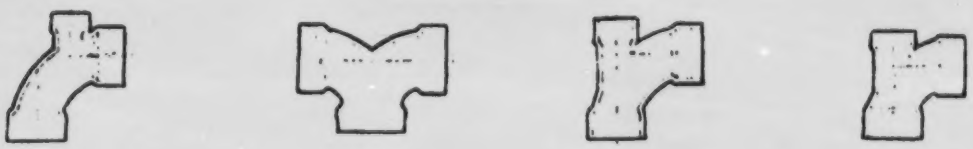
a. Knife.
b. Hacksaw.
c. Portable coping saw.
d. Sabre saw.

73.01.01.08

36. Fitting composition of a plastic angle fitting should match the pipe for a given installation unless:

a. the fitting is to be welded to the pipe.
b. special adhesives are used.
c. a loose fitting installation is called for.
d. the specifications are in error.

THE FOLLOWING 3 QUESTIONS REFERS TO THE ILLUSTRATION PROVIDED BELOW:



#1 #2 #3 #4

37. Figure #2 identifies a(n):

a. 90 degree long turn Ell with a low heel outlet.
b. Three way Ell.
c. Extra long turn 90 degree Ell with a low heel inlet.
d. Extra long turn 90 degree Ell with a high heel inlet.

38. Which of the figures provided above identifies an extra long turn 90 degree Ell with a low heel inlet?

a. #2.
b. #3.
c. #4.
d. #1.

39. Which of the figures identifies a 90 degree long turn Ell with a low heel outlet?

a. #2.
b. #4.
c. #1.
d. #3.

THE FOLLOWING QUESTION REFERS TO THE ILLUSTRATION PROVIDED BELOW

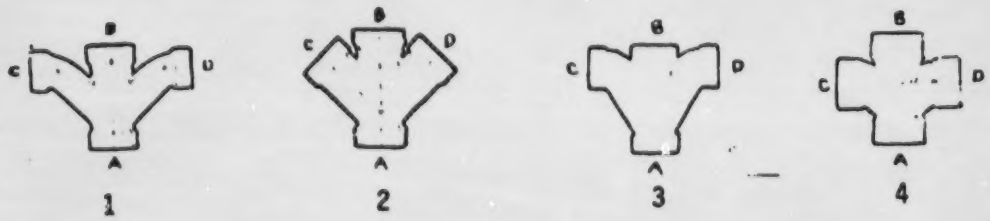
40. Which of the figures above identifies a 1/4 bend vent Ell?

a. #2.
b. #1.
c. #3.
d. #4.

#1 #2 #3 #4

73.01.01.09

THE FOLLOWING 2 QUESTIONS REFER TO THE SET OF FIGURES BELOW:



38. Which of the figures provided above identifies a long turn 90 degree Ell with a low heel inlet?

a. #2.
b. #3.
c. #4.
d. #1.

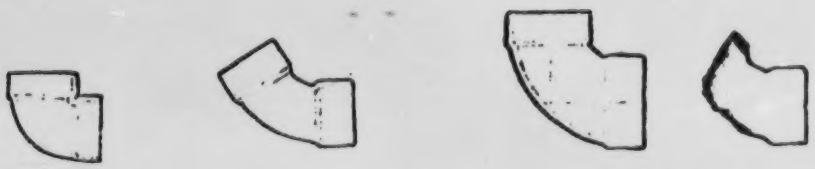
39. Which of the figures identifies a 90 degree long with a low heel outlet?

a. #2.
b. #4.
c. #1.
d. #3.

THE FOLLOWING QUESTION REFERS TO THE ILLUSTRATION PROVIDED BELOW

40. Which of the figures above identifies a 1/4 bend

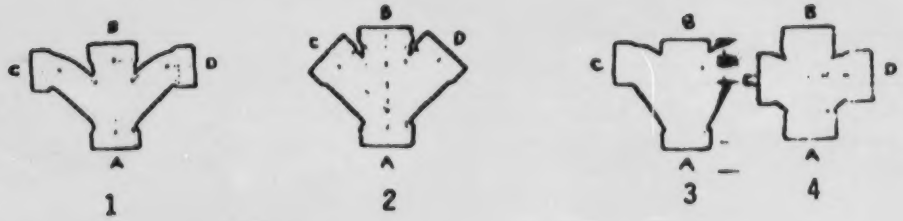
a. #2.
b. #1.
c. #3.
d. #4.



#1 #2 #3 #4

73.01.01.09

THE FOLLOWING 2 QUESTIONS REFER TO THE SETS BELOW:



REFER TO THE CHART ON PAGE 10 FOR THE QUESTIONS NUMBERED 41, & 42:

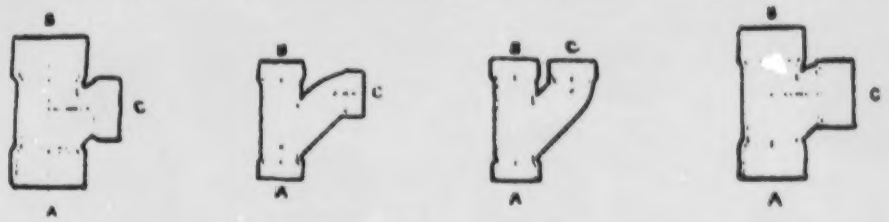
41. Which of the following correctly identifies item #1?

    a. Sanitary cross with side inlet.
    b. Double wye.
    c. Double long turn TY.
    d. Double short turn TY.

42. Identify figure #3.

    a. Double short turn TY.
    b. sanitary cross with side inlet.
    c. double wye.
    d. double long turn TY.

THE FOLLOWING THREE QUESTIONS REFER TO THE SET OF FIGURES SHOWN BELOW:



43. Identify figure #1.

    a. short turn TY reducing (sanitary tee).
    b. long turn TY reducing wye (1/8 bend)
    c. upturn wye.
    d. short turn TY (sanitary tee).

44. Which of the figures shown above identifies a short turn TY (sanitary tee)?

    a. #1.
    b. #4.
    c. #2.
    d. #3.

45. Which of the figures shown above correctly identifies an upturn wye?

    a. #2.
    b. #3.
    c. #1.
    d. #4.

73.01.01.10

46. Which of the following plastic pipe fittings is used to temporarily close pipe openings?

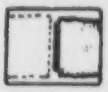
a. Threaded plastic caps/plugs.
b. Closet flange.
c. Adapter.
d. Bushing.

47. Which of the following listed plastic pipe fittings identifies the illustration below?

a. Reducer bushing.
b. Hub adapter.
c. Spigot adapter.
d. Male adapter.

48. Identify the type of plastic fitting illustrated below:

a. male adapter.
b. female adapter.
c. closet flange.
d. reducer coupling.

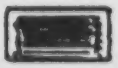


49. What type of plastic pipe fitting is shown below?

a. Test cap.
b. Closet flange.
c. Hub adapter.
d. Adapter coupling.

50. Which of the following listed plastic pipe fittings identifies the illustration below?

a. Reducer bushing.
b. Adapter coupling.
c. Test/dust cap.
d. Closet flange.



73.01.01.11

51. What feature of a threaded pipe insures a water tight joint?

a. The taper of the thread.
b. The angle of the thread.
c. The size of the fittings.
d. The use of an "O" ring.

52. 1/4 and 3/8" pipe have:

a. 18 threads per inch.
b. 12 threads per inch.
c. 24 threads per inch.
d. 15 threads per inch.

53. What is the proper lip angle for steel pipe?

a. 25 - 30 degrees.
b. 10 - 12 degrees.
c. 15 - 20 degrees.
d. 45 - 62 degrees.

54. How many dies are used in a Rigid stock?

a. 5.
b. 3.
c. 4.
d. 6.

55. Which of the following pipe threading features prevents chips from packing and spoiling the threads?

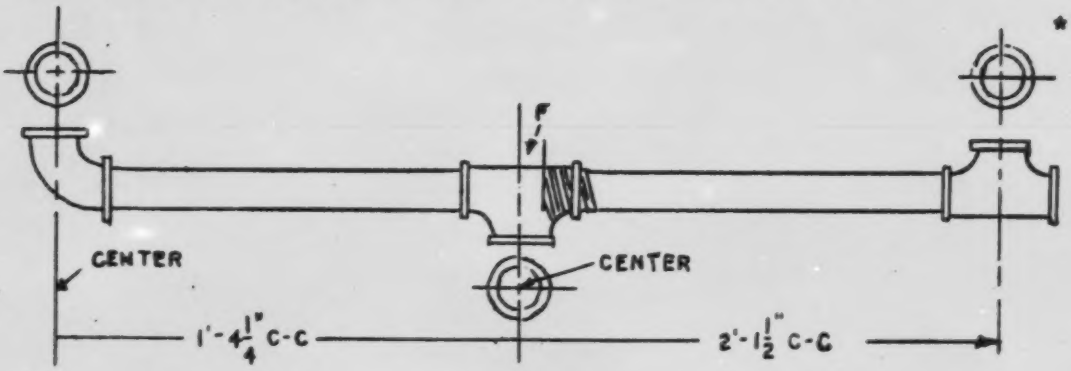
a. Lip of a die.
b. Cutting oil.
c. Starting threads.
d. Chip space.

73.01.01.12

56. What is the center to center measurement between the elbow and the end tee in the illustration provided on the following page?

a. 3' 5 3/4"
b. 3' 4 1/4"
c. 3' 1 1/2"
d. 3' 3"

ILLUSTRATION FOR QUESTION NUMBER 56 ON THE PREVIOUS PAGE:



REFER TO THE CHARTS ON THE NEXT PAGE FOR THE FOLLOWING TWO QUESTIONS:

57. The center to face measurement of a 1/2" malleable elbow is:

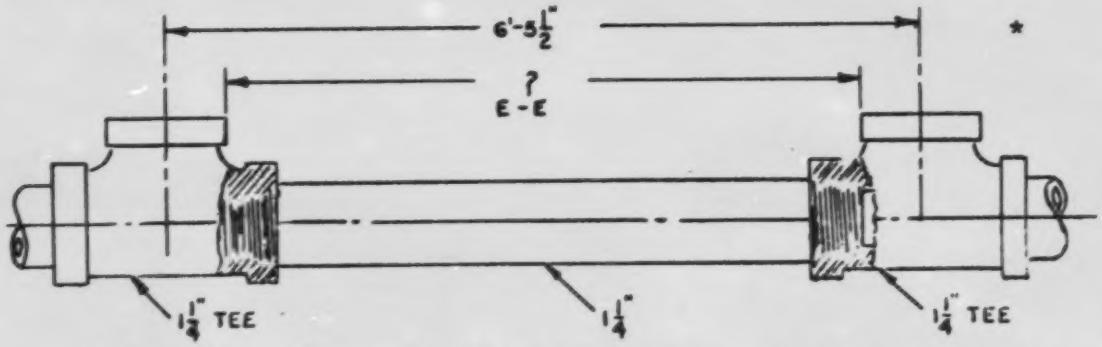
a. 1 1/8".
b. 7/8".
c. 1 5/8".
d. 1 1/4".

58. What is the fitting allowance for a 4" malleable elbow?

a. 2 5/8".
b. 3 3/4".
c. 5 11/16".
d. 8 7/8".

59. Two 1 1/4" malleable tees are to be placed 6'-5 1/2", center-to-center, as in the sketch below. What is the length of pipe between them?

a. 5'-11 13/16".
b. 6'-3 5/8".
c. 6'-3 3/8".
d. 5'-11 11/16".



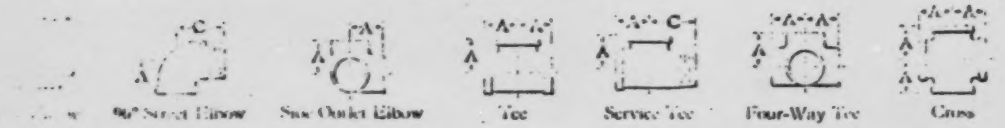
* (From Related Information Plumbing I, Slater, Delmar Publishers.)

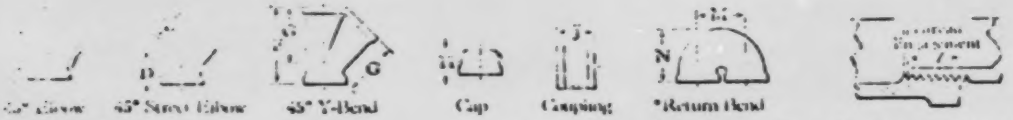
CHARTS FOR QUESTIONS 57, and 58 ON THE PRECEDING PAGE:

150-Pound Malleable Iron Fittings

Dimensions of Straight Sizes, in Inches

Banded and Plain Pattern





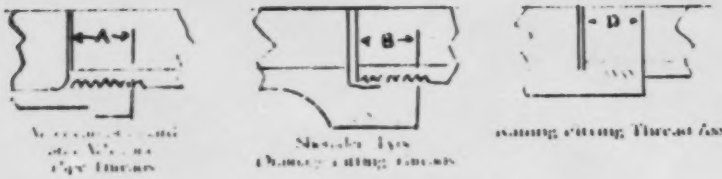
These dimensions apply to both Banded and Plain Fittings; their center to end dimensions are alike.

*Close Pattern Return Bends can not be used to make up parallel ends. The center to center dimension is so close that the bends of adjacent bends will not clear each other.

Size	A	B	C	D	E	F	G	H	J	Return Bends Close M	Close N	Medium M	Medium N	Open M	Open N	Z
⅛	1 1/16	5/8	1	11/16	5/16			5/16	1 1/16							1 1/16
¼	1 3/16	11/16	1 1/16	13/16	3/8			3/8	1 1/16							1 1/16
⅜	1 5/16	13/16	1 1/16	11/16	1 1/16	2 1/8	1 7/16	3/4	1 3/16							1 1/16
½	1 1/2	7/8	1 1/4	13/16	1 3/16	2 7/16	1 11/16	7/8	1 5/16	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/4	1 1/2
¾	1 5/8	1	1 1/2	15/16	1 5/16	2 7/8	2	1 1/16	1 1/2	1 1/4	2 1/16	1 1/2	1 5/16	2	2 1/4	9/16
1	1 1/2	1 1/4	2 1/8	1 1/16	1 1/2	3 3/8	2 7/16	1 3/16	1 11/16	1 1/2	2 1/2	1 7/8	2 1/4	2 1/2	2 3/4	11/16
1 1/4	1 3/8	1 5/16	2 7/8	1 1/4	1 11/16	4 1/16	2 15/16	1 1/4	1 15/16	1 3/4	2 13/16	2 1/4	2 13/16	3	3 3/16	11/16
1 1/2	1 13/16	1 7/16	2 11/16	1 3/8	1 7/8	4 1/2	3 5/16	1 5/16	2 1/8	2 1/16	3 3/16	2 1/2	3 3/16	3 1/2	3 5/8	11/16
2	2 1/16	1 11/16	3 1/4	1 11/16	2 1/4	5 7/16	4	1 7/16	2 1/2	2 1/8	3 7/8	3	3 7/8	4	4 1/4	3/4
2 1/2	2 11/16	1 15/16	3 13/16			6 1/4	4 11/16	1 13/16	2 7/8					4 1/2	4 13/16	13/16
3	3 1/16	2 1/16	4 1/2			7 1/4	5 9/16	1 15/16	3 3/16					5	5 9/16	1
3 1/2	3 7/16	2 1/2						1 15/16								1 1/16
4	3 3/4	2 5/8	5 11/16			8 1/8	6 15/16	2 1/16	3 11/16					6	6 11/16	1 1/8
5	4 1/2	3 1/16						2 5/16								1 1/4
6	5 1/16	3 7/16						2 9/16								1 5/16

Normal Engagement

between Male and Female Threads



Size of Pipe	D Length of Pipe Thread Recessed in Fitting
⅛	⅜
¼	½
⅜	½
½	¾
¾	¾
1	1
1 1/4	1 1/16
1 1/2	1 1/16
2	1

Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14
A	1/4	3/8	3/8	1/2	19/32	11/16	1 1/16	1 1/16	2 1/16	1 15/16	1	1 15/16	1 11/16	1 1/4	1 15/16	1 17/16	1 5/8	2	
B						9/16	5/8	5/8	5/8	7/8	15/16	1	1 1/16	1 3/16	1 1/4	1 3/8	1 7/16	1 5/8	1 7/8
D						1/2	5/8	5/8	5/8	7/8	15/16	1	1 1/16	1 3/16	1 1/4	1 3/8	1 7/16	1 5/8	1 7/8

60. What is meant by the term "taper"?.

a. A gradual decrease in diameter.
b. A gradual increase in diameter.
c. A rapid decrease in diameter.
d. A rapid increase in diameter.

73.01.01.13

61. What is the next size drainage elbow above and below 1 1/2"?

a. 1 1/4" & 1 3/4".
b. 1 1/4" & 2".
c. 1 3/8" & 1 5/8".
d. 1 7/16" & 1 9/16".

62. In how many different angles are drainage pipe elbows available?

a. 9.
b. 7.
c. 5.
d. 6.

63. All 90 degree drainage fittings are tapped to incline the branch pipe:

a. 1/2" per foot.
b. 1/8" per foot.
c. 1/4" per foot.
d. 1/16" per foot.

64. What is the name of the point where two lines of an angle meet?

a. Circumference.
b. Radius.
c. Vertex.
d. Diameter.

65. A pipe railing forming a square would require how many and what angle fittings?

a. Four (4) 90 degree side outlet elbows.
b. Two (2) 180 degree side outlet elbows.
c. Five (5) 60 degree side outlet elbows.
d. Ten (10) 30 degree side outlet elbows.

73.01.01.14

66. Drainage tees range in sizes from:

a. 1½" to 12".
b. 1" to 9".
c. 1½" to 8".
d. 1 1/8" to 7½".

67. What are the three patterns of drainage tees?

a. 30 degree turn, 45 degree turn, and 90 degree turn.
b. 45 degree turn, 90 degree turn, and straight.
c. 30 degree turn, 60 degree turn, and 90 degree turn.
d. Straight, short turn, and long turn.

68. Which of the following drainage tee patterns is permitted only on vent lines?

a. 60 degree.
b. Short turn.
c. Straight.
d. 30 degree.

69. Which of the following drainage tee patterns is used on either horizontal or vertical lines when there is enough space?

a. Short turn.
b. Straight.
c. Long turn.
d. 60 degree.

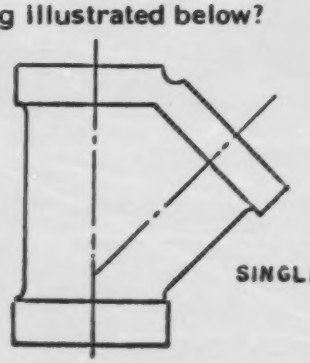
70. Which drainage tee offers the least resistance to the flow of sewage in a drain line?

a. Long turn tee.
b. Straight tee.
c. 45 degree tee.
d. 30 degree tee.

73.01.01.15

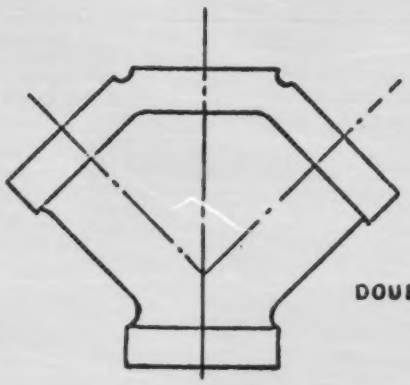
71. What is the angle of the fitting illustrated below?

a. 45 degrees.
b. 30 degrees.
c. 60 degrees.
d. 90 degrees.



72. What is the angle between the branches of the double Y in the illustration provided below?

a. 180 degrees.
b. 90 degrees.
c. 45 degrees.
d. 60 degrees.



73. What type of tee is permitted in vent lines only?

a. The straight tee.
b. Bils malleable tee.
c. The sanitary tee.
d. the galvanized tee.

THE FOLLOWING TWO QUESTIONS REFER TO THE ILLUSTRATION PROVIDED ON THE FOLLOWING PAGE:

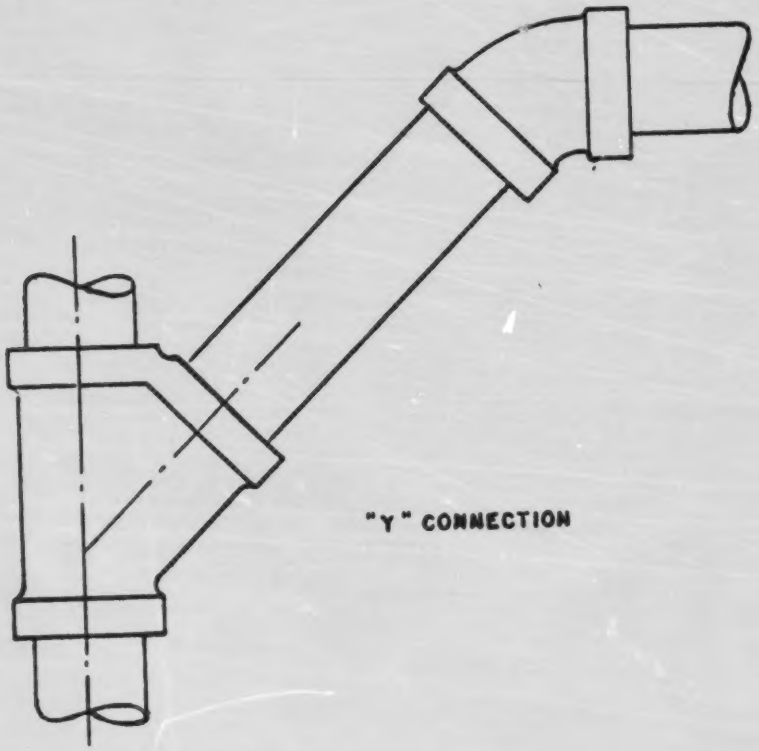
74. What is the angle between the vertical pipe and the branch in the illustration on the following page?

a. 60 degrees.
b. 180 degrees.
c. 45 degrees.
d. 90 degrees.

75. Using the illustration on the following page, what is the angle from the center line to one branch of the wye?

a. 45 degrees.
b. 60 degrees.
c. 90 degrees.
d. 22½ degrees.

THE FOLLOWING ILLUSTRATION REFERS TO QUESTIONS NUMBER 74 and 75:



"Y" CONNECTION

UNIT TEST ANSWER SHEET

PRETEST

Occupational Area:
File Code: 73.01.01.00.A2-2
Name:

ANSWERS

73.01.01.01	1. A		73.01.01.05	21. A		73.01.01.09	41. C
	2. B			22. C			42. A
	3. C			23. A			43. A
	4. D			24. C			44. B
	5. C			25. B			45. B
73.01.01.02	6. A		73.01.01.06	26. D		73.01.01.10	46. A
	7. A			27. B			47. A
	8. D			28. C			48. B
	9. B			29. A			49. B
	10. C			30. D			50. C
73.01.01.03	11. B		73.01.01.07	31. A		73.01.01.11	51. A
	12. C			32. C			52. A
	13. B			33. C			53. C
	14. B			34. C			54. C
	15. A			35. B			55. D
73.01.01.04	16. A		73.01.01.08	36. B		73.01.01.12	56. A
	17. A			37. B			57. A
	18. A			38. B			58. A
	19. A			39. B			59. C
	20. A			40. B			60. A

UNIT TEST ANSWER SHEET
PRETEST

Occupational Area: _____
File Code: 73.01.01.00.A2-2
Name: _____

ANSWERS

73.01.01.13	61. B _____	81. _____	101. _____
	62. B _____	82. _____	102. _____
	63. C _____	83. _____	103. _____
	64. C _____	84. _____	104. _____
	65. A _____	85. _____	105. _____
73.01.01.14	66. C _____	86. _____	106. _____
	67. D _____	87. _____	107. _____
	68. C _____	88. _____	108. _____
	69. C _____	89. _____	109. _____
	70. A _____	90. _____	110. _____
73.01.01.15	71. A _____	91. _____	111. _____
	72. B _____	92. _____	112. _____
	73. A _____	93. _____	113. _____
	74. D _____	94. _____	114. _____
	75. A _____	95. _____	115. _____
	76. _____	96. _____	116. _____
	77. _____	97. _____	117. _____
	78. _____	98. _____	118. _____
	79. _____	99. _____	119. _____
	80. _____	100. _____	120. _____

File Code: 73.01.01.01.A2-0

Date Published: 6/30/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Soil Pipe Nomenclature and Cutting

OBJECTIVES:

Identify cast iron soil pipe by weight, size and type of joint. Cut cast iron pipe to specified lengths using appropriate tools and procedure.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test and cut to length a cast iron pipe.

A performance test for soil pipe cutting is taken when the student completes this unit. Successful completion is meeting the criteria listed on the performance test.

RESOURCES:

Soil pipe cutter.
Cold chisel.
Tools, basic.

PROCEDURE:

1. Read the following:

To cut cast iron pipe involves using tools in a proper manner on the right pipe. The type of pipe to use is specified in the job plans. The procedure for cutting the cast pipe will depend upon the cutting tools available.

After knowing what type of soil pipe is specified the identification of the soil pipe to meet the requirements is necessary. The objective in this activity is to cut the soil pipe and identify the cast iron soil pipe.

Identifying Cast Iron Pipe

Cast iron soil pipe is available in three weights: standard, medium (or service), and extra heavy. The service or medium weight soil pipe is usually specified for household sewers and drains. The extra heavy weight soil pipe is generally specified when corrosive liquids are carried or the location is/or may be exposed to vibration or setting. The standard weight pipe is generally used in temporary locations and where standards do not require medium or extra heavy weight.

The symbol SV is used to specify service weight soil pipe. The symbol XH is used to refer to extra heavy weight soil pipe. These symbols will be found on the pipe and fittings.

Cast iron pipe is made in lengths with a single hub as shown in Figure 1; a double hub shown in Figure 2; and no-hub in Figure 3.

The hub (bell) and spigot are two terms used that refer to the ends of a hub type soil pipe as shown in Figure 1.

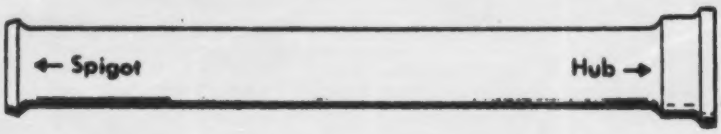


FIGURE 1: Single Hub Cast Iron Soil Pipe

Double Hub pipe is used to reduce waste when cutting. After cutting double hub pipe you have two pieces each with a hub.

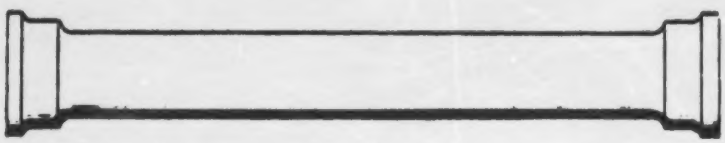


FIGURE 2: Double Hub Cast Iron Soil Pipe

No-hub soil pipe is becoming more commonly used because:
(1) there is less pipe waste; (2) the pipe fittings take up less space than hub type; and (3) joining takes less time than lead caulking. The no-hub soil pipe is available only in one weight.

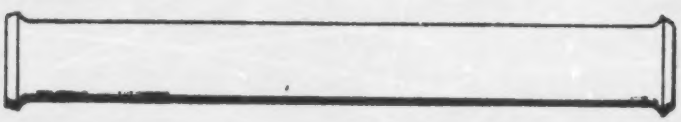


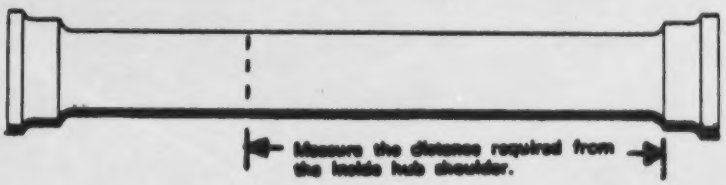
FIGURE 3: No-Hub Cast Iron Soil Pipe

Cast iron soil pipe size is identified by the inside pipe diameter.

Measurements for Soil Pipe Cutting:

On the job, soil pipe will have to be cut to fit. Before cutting the pipe, the correct length needed must be determined and the pipe marked at the place to be cut. When using hub and spigot pipe it is necessary that the spigot end of the pipe fit all the way into the adjoining hub. This requires making allowance for hub depth. To make this allowance, measure and mark a hub type pipe for cutting as shown in Figure 4.

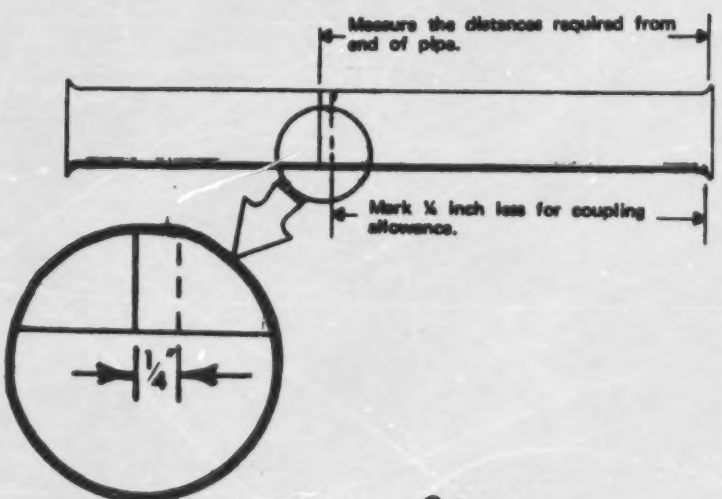
FIGURE 4: Measuring and Marking Hub Type Pipe for Cutting



The distance shown in Figure 4 is that needed to fit the space required on the job.

If no-hub soil pipe is being used, the measurement and marking is done as shown in Figure 5. A quarter (1/4) inch is subtracted from the space requirement on the job. This distance is taken up by the couplings used to join no-hub pipes and fittings.

FIGURE 5: Measuring and Marking No-Hub Type Pipe for Cutting



Cutting Cast Iron Soil Pipe:

1. The cutting of the soil pipe will usually be done with a snap type of soil pipe cutter. Soil pipe may, however, be cut with a chisel and a hammer. The Ridgid Soil Pipe Cutter is to be used in cutting two lengths of pipe for this LAP. A hammer and a chisel is used to cut one length of soil pipe.

2. Obtain the soil pipe and soil pipe cutter.

3. Cut one 6" length and one 5" length using the Ridgid Soil Pipe Cutter. Read and do the directions entitled "Directions for Using the Ridgid Soil Pipe Cutter".

NOTE: All cuts are to be within ± a quarter inch of the given length and square.

DIRECTION FOR USING THE RIDGID SOIL PIPE CUTTER

To Set Cutter

1. Lift and turn ratchet knob to neutral position (Ratchet pin not in groove).

2. Turn adjusting knob clockwise until side arms are fully open.

3. Place the cutter on the pipe so the cutter wheels are on the mark and the handle is straight on the longer part of the pipe, with the ratchet knob facing away from the pipe. (See Figure 1 for names of parts.)

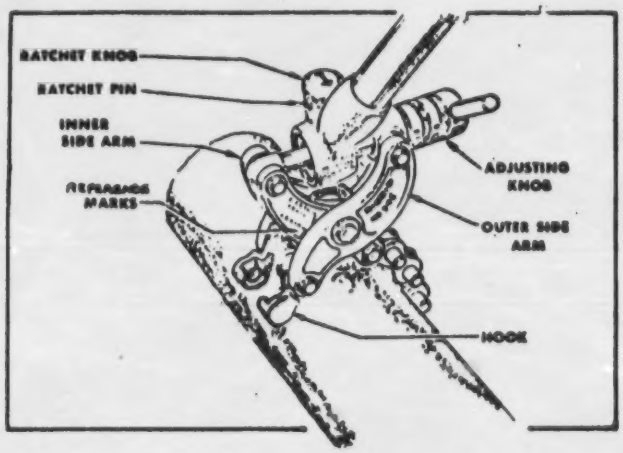


FIGURE 1

To Adjust Chain:

4. After cutter is properly placed, at the point on the pipe to be cut, wrap chain around pipe snugly, place chain pin into hooks as shown in Figures 2 and 3.

5. Turn adjusting knob counter-clockwise until the chain is tight. (Note the Reference Mark designated as A, B, C, D, or E and use the next larger Reference Mark when setting cutter for the same size pipe in the future.

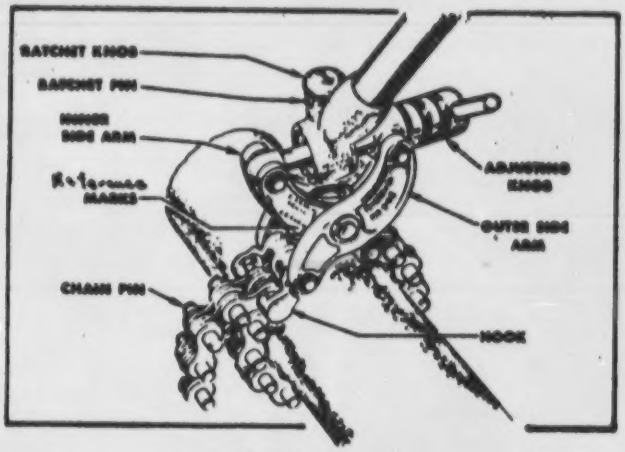


FIGURE 2

6. Turn the Ratchet Knob so that the arrow points to the word "cut" on the Ratchet Housing.

To Cut Pipe:

7. Use a ratcheting motion in the direction indicated by the arrow on Ratchet Knob until the pipe is severed. For greater ease of operation, keep body weight above handle while ratcheting. Raising the handle too close to a vertical position makes pumping action more difficult.

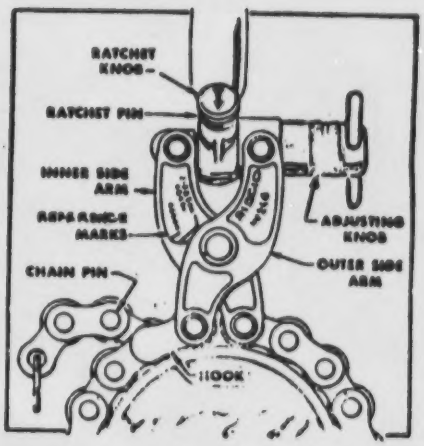


FIGURE 3

If Ratcheting Action Stops

If ratcheting action stops before pipe is severed, you have jammed the cutter. DO NOT force the handle or Adjusting Knob, simply lift, turn and hold Ratchet Knob so that arrow points to word "Open" on Ratchet Housing. Push in Ratchet Knob to insure engagement of Pawl. Use a pumping action in direction indicated by arrow to release the chain - Reset Cutter using proper Chain Pin in Hook to assure ample travel for cutting action.

Important

Keep tool clean. Wire brush dirt from Chain.

Cutting Cast Iron Soil Pipe: continued.

4. Cut one 7" length of pipe using a hammer and chisel. Use the following procedure:

DIRECTIONS FOR USING A HAMMER AND CHISEL TO CUT SOIL PIPE

1. Mark around the pipe at the point to be cut.
2. Support the pipe at the mark using a piece of wood.
3. Using the chisel and hammer, lightly score the pipe on the mark. (All the way around the pipe.)
4. Continue scoring around the pipe using heavier blows until the pipe is severed.

Cutting Cast Iron Soil Pipe: continued.

5. Have the three lengths of pipe evaluated by an instructor.
6. When the pipes have been cut satisfactorily, clean and return the tools and take the LAP test.
7. Score the LAP test and return it.
8. Find out the reason for any missed items and then proceed to the next assigned LAP.

Student: _____ File Code: 73.01.01.01.A2-2

Date: _____ Date Published: 10-24-74

LAP TEST: SOIL PIPE NOMENCLATURE AND CUTTING

1. Which of the following is a reason for the popularity growth of no hub soil pipe over hub type soil pipe?

   a. Joining takes more time than lead caulking.
   b. It weighs more.
   c. The pipe fittings take up more space than hub type.
   d. There is less pipe waste.

2. Soil pipe is usually made of:

   a. steel.
   b. white cast iron.
   c. gray cast iron.
   d. aluminum.

3. Which of the following tools is soil pipe cut?

   a. Knife.
   b. Hammer and cold chisel.
   c. Portable handsaw.
   d. Table saw.

4. If you wished to cut a piece of soil pipe 24" long, where would you measure from on a length of double hub?

   a. From the center of the pipe.
   b. From the front of the hub.
   c. From the center of the hub.
   d. From the back of the hub.

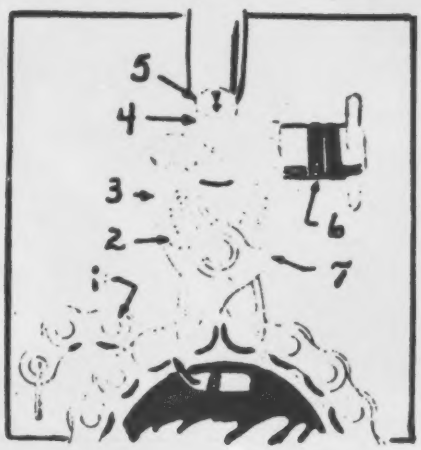
5. Cast iron soil pipe size is identified by:

   a. its inside diameter.
   b. its length.
   c. its weight.
   d. both its length and weight.

6. When cutting no hub soil pipe, how much tolerance must be allowed for the couplings to joint no hub pipe and/or fittings?

   a. 1".
   b. 1/2".
   c. 3/4".
   d. 1/4".

THE FOLLOWING ILLUSTRATION IS PROVIDED FOR THE NEXT FOUR QUESTIONS:



7. Which of the following identifies item #2?

   a. Adjusting knob.
   b. Ratchet pin.
   c. Marks.
   d. Ratchet knob.

8. Identify item #5.

   a. adjusting knob.
   b. ratchet pin.
   c. ratchet knob.
   d. chain pin.

9. Which of the following identifies item #6?

   a. inner side arm.
   b. adjusting knob.
   c. outer side arm.
   d. marks.

10. Identify item #8.

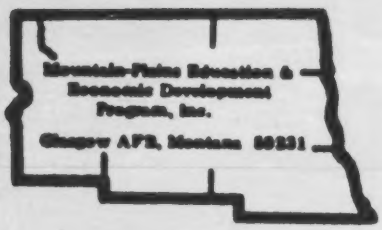
    a. ratchet pin.
    b. chain pin.
    c. hook.
    d. adjusting knob.

LAP TEST ANSWER KEY: SOIL PIPE NOMENCLATURE AND CUTTING

1. D
2. C
3. B
4. D
5. A
6. D
7. C
8. C
9. B
10. C

File Code: 73.01.01.02.A2-0

Date Published: 6-30-75



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Joining Soil Pipe and Fittings

OBJECTIVE:

Connect various types of soil pipe and soil pipe fittings with caulked lead joints, hub gasket and no-hub coupling using the appropriate tools, materials and procedures.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 test items on a multiple-choice test combined with "Soil Pipe Bends, Wyes and Combinations" LAP test and is taken after completing that LAP.

Connect the types of cast iron soil pipe and fittings that meet the criteria listed on the unit performance test and is taken after completing this unit.

RESOURCES:

Asbestos joint runner
Cast iron pipe and fittings (hub type)
Caulking irons (inside and outside)
Hammer
Ladle
Lead
Lead pot
Oakum
Pipe puller for hub type soil pipe
Propane melting furnace.
Torque wrench
Yarning irons

PROCEDURE:

1. Read the following:

   To join cast iron soil pipe and fittings requires the use of tools and materials in a proper manner. The three types of connections used in this activity are: caulked lead, hub gasket and no-hub coupling.

   The objective of this activity is to join pipes and fittings using each type of connection. To accomplish the objective, the hub as well as no-hub soil pipe connections are made. Two methods are used in joining the hub type pipes and fittings. The caulked lead and hub gasket method will be used. Making the caulked lead connection is done in both vertical and horizontal positions. Lead will be melted with a propane melting furnace. The final method of connecting cast iron soil pipe in this activity couples no-hub pipe or fittings.

Principal Author(s): T. Bundy

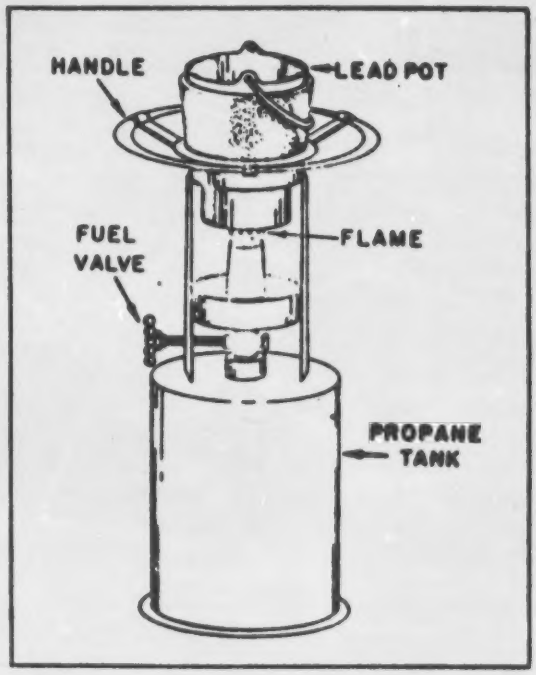
Caulked Lead Joints

A plumber uses a melting furnace for melting the lead and keeping it at a proper temperature for pouring into joints.

2. To prepare for the first caulked lead joint get the following:

(1) propane melting furnace
(2) lead pot
(3) lead
(4) ladle
(5) oakum
(6) two pieces of hub pipe or one piece of hub pipe and one hub fitting
(7) caulking irons (inside and outside)
(8) yarning iron
(9) hammer
(10) asbestos joint runner

Figure 1. Propane Melting Furnace



3. Prepare the melting furnace using the following procedure:

(1) Make a thorough inspection for leaks. If leaks are found, repair before use. If none, proceed to the next step.

(2) Hold a lighted match;rolled, folded or twisted piece of lighted paper by the burner opening (marked flame in Figure 1).

CAUTION: Wear gloves and goggles when lighting a furnace.

(3) Carefully open the fuel valve until the burner lights.

CAUTION: If valve is opened too much or too rapidly, the escaping gas may extinguish the lighter flame. If this does happen, close the valve and begin with step (2).

(4) Adjust the valve to provide the desired heat for melting the lead.

(5) Place the quantity of lead to be melted in the lead pot.

Key Point: When the lead turns a bluish tinge, it is ready for pouring.

4. While the lead is melting, go to the work station for making a lead caulked joint.

5. Read and do the following:

Vertical Joint:

Joints in vertical piping are usually easiest to make. The steps to take in making a vertical joint follow:

(1) Inspect the hub and spigot ends of the pipes or fittings to be caulked to make sure that they are free of moisture. If wet, wipe or heat until dry.

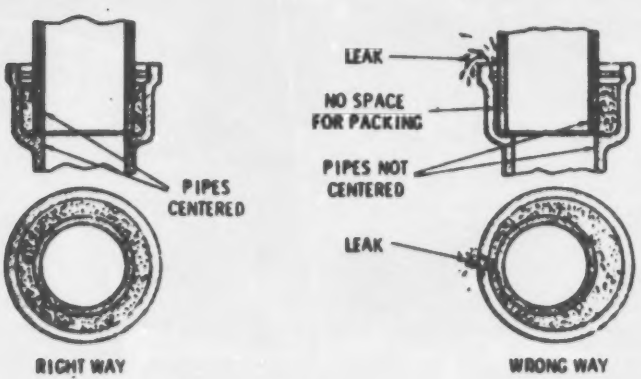
CAUTION: Moisture in joint will cause molten lead to spatter when poured into joint.

(2) Place the spigot end of the pipe or fitting into the hub of the other pipe or fitting.

(3) Align the pipe or fitting so that there is equal space between the pipe or fitting and the hub as shown in Figure 2.

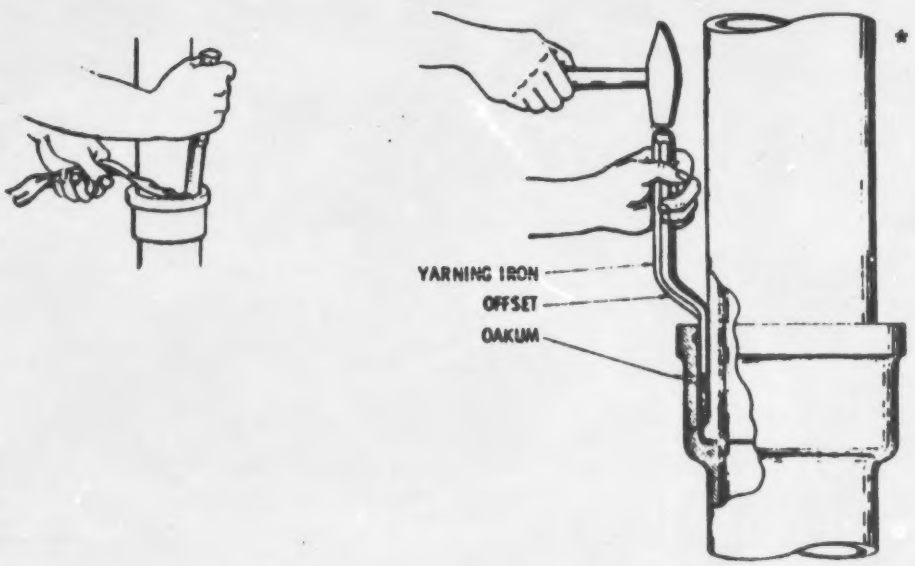
Key Point: A joint not properly centered is apt to leak on the side that has the least amount of oakum.

Figure 2: The Right and Wrong Way to Align a Hub Joint



(4) Tamp Oakum in the space between the spigot and hub. Use a yarning iron, as shown in Figure 3, to evenly pack the oakum to within 3/4 to 1 inch from the top of the hub. First tamp the oakum by hand then pack it using a hammer.

Figure 3: Packing with Oakum



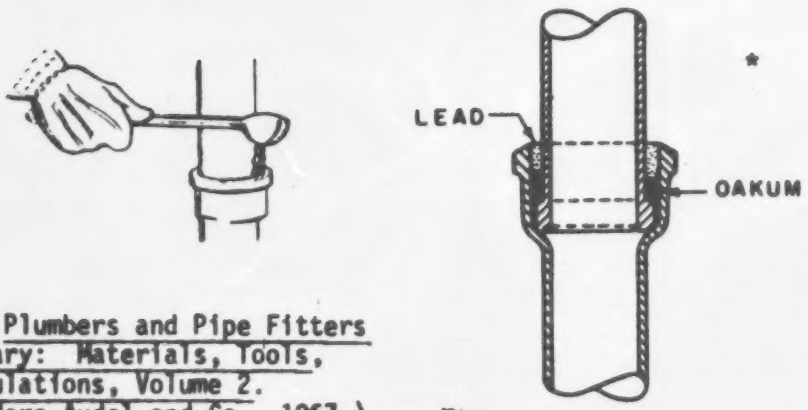
Key Point: A vertical joint that is firmly packed, properly done will hold the top pipe or fitting without support.

(5) Skim any slag from the surface of the molten lead in the lead pot.

Key Point: Heat ladle in furnace flame before skimming and dipping lead.

(6) Pour molten lead into the remaining space in the joint until filled to the top of the hub as shown in Figure 4.

Figure 4: Pouring Lead in Joint



*(From Plumbers and Pipe Fitters Library: Materials, Tools, Calculations, Volume 2. Theodore Audel and Co., 1967.)

Key Point: The joint should be made in one pouring. Lead should be hot enough to flow evenly without forming bubbles or lumps. Don't allow lead to get red hot because it will burn the oakum.

(7) After the lead has cooled (about a minute), begin caulking it as shown in Figure 5. Use a hammer and inside caulking iron. First work around the inner half of the joint against the spigot. Next use an outside caulking iron and caulk the lead next to the hub.

Figure 5: Caulking Lead Joint

Key Point: Take care not to strike the caulking iron too hard since it may crack the hub.

6. Have an instructor evaluate the caulked joint.

7. After satisfactory completion of a vertical caulked joint clean up work station; return tools and materials; and go to the work station for making a lead caulked joint in the horizontal position.

8. Read and do the following:

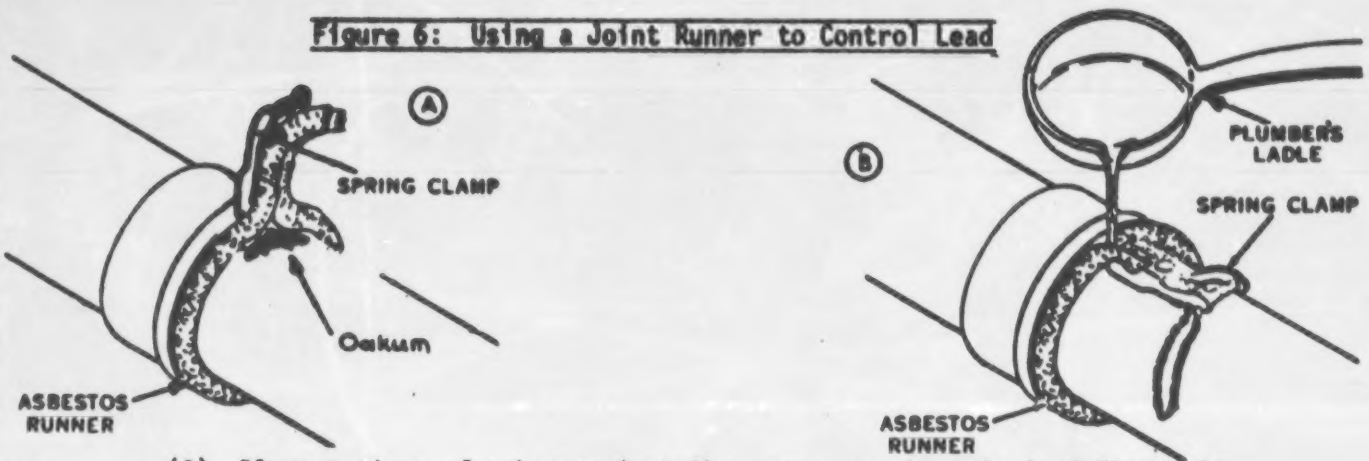
Horizontal Joint:

Connecting a horizontal hub type of joint is the same as that for the vertical one except for the position of the joint and the use of a joint runner. The steps to take in making a horizontal joint follow:

(1) Take steps (1) through (4) that were used in making a vertical joint.

(2) Wrap and clamp the asbestos joint runner snugly around the spigot end of the pipe or fitting and against the hub opening, as shown in A of Figure 6.

Figure 6: Using a Joint Runner to Control Lead



(3) Place a piece of oakum against the runner as shown in A of Figure 6.

(4) Bend the runner over the oakum as shown in B of Figure 6.

Key Point: Push the joint runner against the hub opening all around the pipe to make a tight seal for the molten lead. There will be a small triangular opening, where the runner is clamped, into which the lead is poured. The piece of oakum will prevent lead from leaking where the runner is clamped and bent against the pipe.

(5) Skim any slag from the surface of the molten lead in the lead pot.

(6) Pour the molten lead into the joint through the opening by the runner clamp as shown in Figure 6.

Key Point: Fill with lead to the top of the joint runner opening.

(7) After lead has cooled, remove the runner clamp and runner.

(8) Trim any excess lead from around the joint with a cold chisel.

(9) Caulk the lead as described in step (7) for caulking a lead hub type joint in the vertical position.

9. Have the instructor evaluate the caulked joint.

10. After satisfactory completion of a horizontal joint, clean the workstation and return the tools to the racks.

11. Go to the Hub Gasket workstation, read and do the following: (see Page 7)

Hub Gasket Joint

A hub gasket may be used to seal hub type of joints. This type of connection takes less time to assemble and avoids the hazards of the melting furnace and the molten lead.

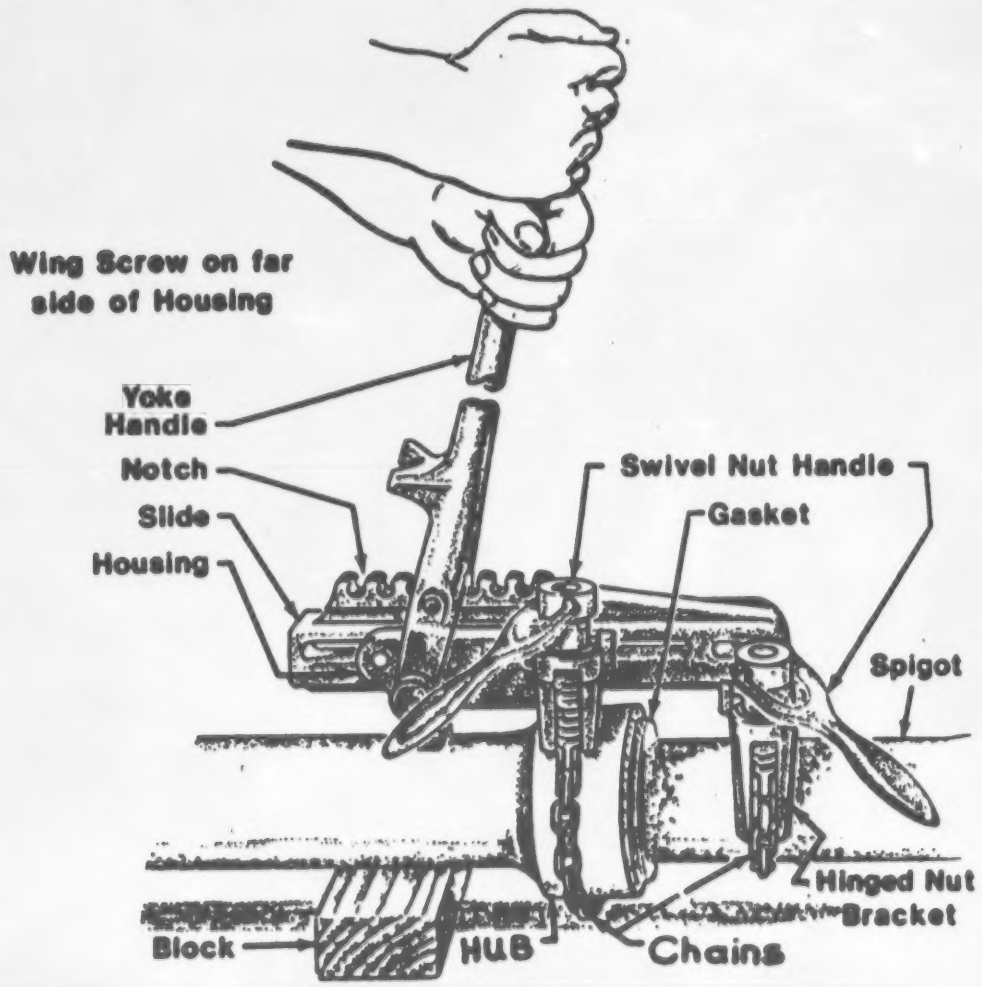
The steps to take in making a hub gasket connection follow:

To Assemble Joint:

(1) Obtain the Ridgid soil pipe assembly tool, neoprene hub gasket, gasket lubricant, and the pipe and/or fittings to be connected.

(2) Block up hub with 2 x 4 block as shown in Figure 7.

Figure 7: Gasket Type Assembly of Hub Soil Pipe and Fittings



(3) Insert and lubricate gasket.

Key Point: Prepare the neoprene gasket by grasping it in both hands with thumbs near inner ends. Press as though to turn the gasket inside out as shown in Figure 8. Insert the gasket so that only the lip is exposed outside of the hub. Release the gasket and it will snap into place as shown in Figure 7.

Figure 8: Assembling Gasket

(4) Place the housing end of the tool on the hub so that the chain surface will go around the hub. Refer to Figure 7 as needed for this and the following steps.

(5) Wrap hub chain around the hub and hook into slot.

(6) Tighten the chain with the swivel nut handle.

(7) Lift the yoke handle out of notch in slide.

(8) Move slide toward the spigot of pipe or fitting being connected.

Key Point: If pipe is being connected, move the slide as far as it will go. If a fitting is being connected, move the slide out to the maximum distance that the hinged nut bracket and chain can be clamped to the straight part of the fitting.

(9) Start spigot end of pipe or fitting into gasket.

Key Point: If a cut end of pipe is being inserted, that end should be chamfered. Use a chamfering tool or file if needed.

(10) Wrap chain around plain end of pipe or fitting and hook into slot.

(11) Tighten chain with the swivel nut handle.

(12) Straddle hub end of the pipe to which the hub chain is clamped and face toward the joint.

(13) Lift yoke handle, lean forward and engage yoke handle with a notch in the slide.

(14) Pull on yoke handle to assemble joint.

Key Point: If the joint is not fully assembled on the first pull, lift yoke handle and move it forward to the next notch in the slide and finish the assembly.

12. Have an instructor evaluate the joint.

13. If satisfactory connection was made, disassemble the connection using the following steps:

To Disassemble Joint:

To disconnect a hub gasket joint, use the Ridgid soil pipe assembly tool as follows:

(1) Attach the tool as described in steps to assemble joint numbers (4), (5), (6), and (7).

(2) Position the slide so that the hinged nut bracket is close to the hub.

(3) Wrap chain around pipe or fitting and hook into slot.

(4) Tighten chain with swivel nut handle.

(5) Straddle hub end and face toward the joint.

(6) Lift yoke handle, place in vertical position with pipe, and engage yoke handle with a notch in the slide.

(7) Push on yoke handle to dissassemble the joint.

14. Clean and return tools and material.

15. Go to the workstation for no-hub jointing.

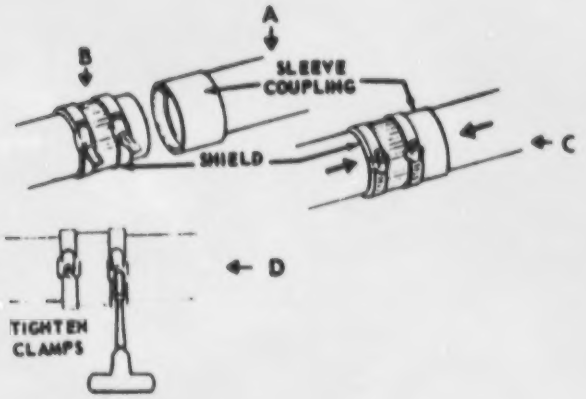
No-Hub Joint

16. Read and do the following:

No-hub pipe and fittings are probably the easiest to assemble. The time required to make a no-hub connection is less than the hub connection. Make the no-hub joint taking the following steps:

(1) Place the sleeve coupling over one end of the pipe or fitting to be connected. See A in Figure 9.

Figure 9: Connecting No-Hub Pipe and Fittings



Key Point: Push it on as far as it will go.

(2) Place the stainless steel shield with band clamps over the other pipe end. See B in Figure 9.

(3) Push the second pipe end into the sleeve coupling as shown by C in Figure 9.

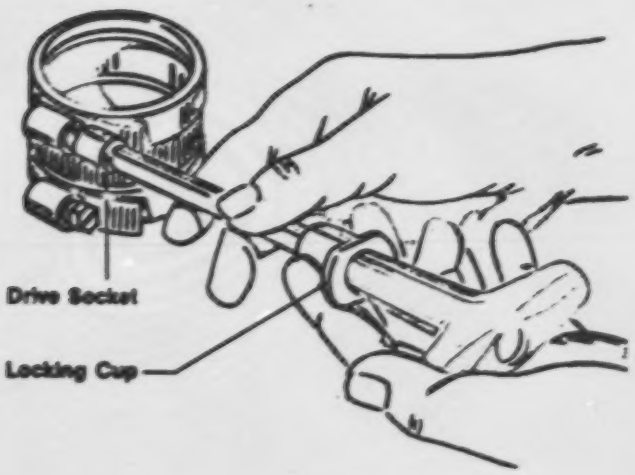
Key Point: Push the pipe end in as far as it will go. The pipes or fittings ends are to be firmly butted against the molded shoulder inside of the coupling.

(4) Slide the steel shield with band clamps over the coupling as shown in D of Figure 9.

(5) Tighten the two band clamps evenly using a no-hub torque wrench.

Key Point: Place the wrench in line with the screw as shown in Figure 10. Alternately tighten both screws until the torque wrench clicks on each. To loosen band clamp screws place the flats on the locking cup parallel with the T-handle as shown in Figure 10 and pull back on the locking cup. Hold locking cup back and turn the torque wrench counter-clockwise.

Figure 10: Using No-Hub Torque Wrench



17. Have an instructor evaluate the connection.
18. If the connection is satisfactory, dissassemble joints.
19. Clean up the workstation, tools and materials.
20. Return tools and materials.
21. Begin the next assigned LAP.

File Code: 73.01.01.03.A2-0

Date Published: 6/30/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Soil Pipe Bends, Wyes and Combinations

OBJECTIVE:

Identify by size, function and type of joint the various soil pipe bends, wyes and combination fittings.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 test items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing I, Slater.
Assortment of cast iron soil pipe bends, wyes and combinations.

PROCEDURE:

1. Read the following:

In this activity identification of soil pipe bends, wyes and combinations is expected. To assist with identification, illustrations and descriptions are provided. Also included is information about the function of the fitting. After reading about the various fittings, experience in actually identifying fittings is provided.

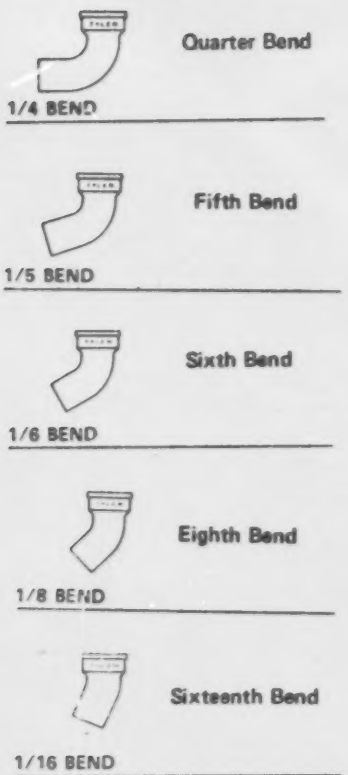
Hub Type Fittings

Bends:

Changes in direction of a single pipe in drainage and vent systems are made with fittings called bends. Bends are made with five different angles. The five different bends are called 1/4, 1/5, 1/6, 1/8 and 1/16 bend. Figure 1 shows each of these bends.

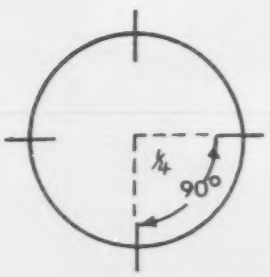
Principal Author(s): T. Bundy

Figure 1: Five Soil Pipe Bends



A bend usually takes its name from the fractional part of the circle made by the single bend fitting. A quarter (1/4) bend, for example, makes one-fourth of a circle as shown in Figure 2. Notice that it takes four of the quarter bends to make the circle. Each bend is one-fourth of the circle. In degrees a quarter bend is then 1/4 of 360^{0} or $360^{0} \div 4 = 90^{0}$.

Figure 2: Quarter (1/4) Bend

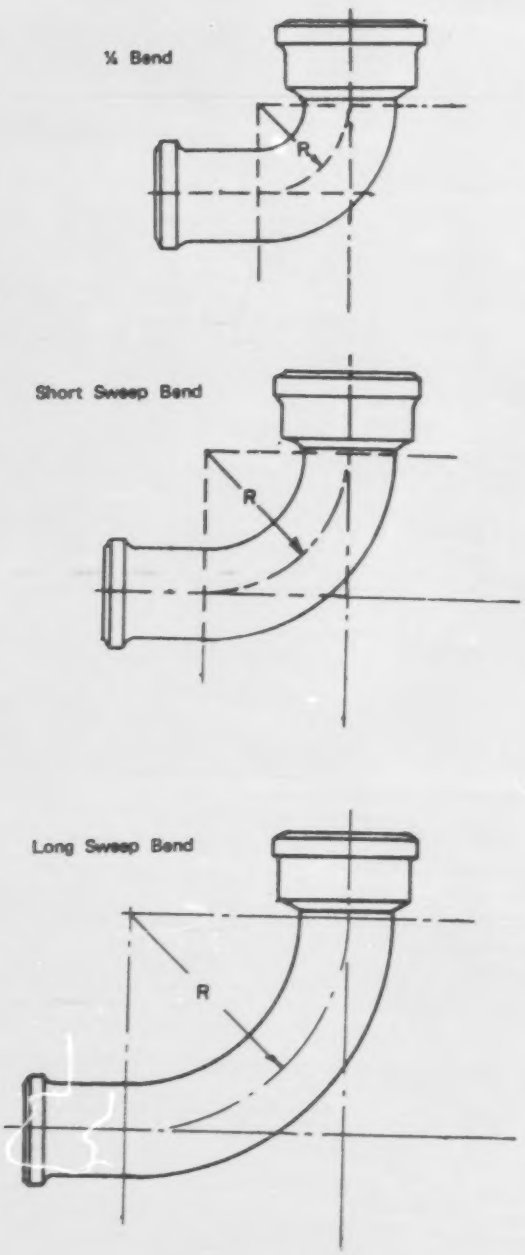


The fifth (1/5) bend makes one-fifth of a circle as shown in Figure 3. Each bend is one-fifth of the circle. A fifth bend is 1/5 of 360^{0} or $360^{0} \div 5 = 72^{0}$.

Figure 3: Fifth (1/5) Bend

Quarter bends come in three patterns. These patterns are shown in Figure 4. When the sweep becomes longer, the resistance to the waste flow becomes less. In the case of a 2 inch pipe the quarter bend has a sweep radius (R) of 3 inches. See R in Figure 4. The short sweep bend for the 2 inch pipe has a sweep radius of 5 inches. The 2 inch long sweep bend has an 8 inch sweep radius.

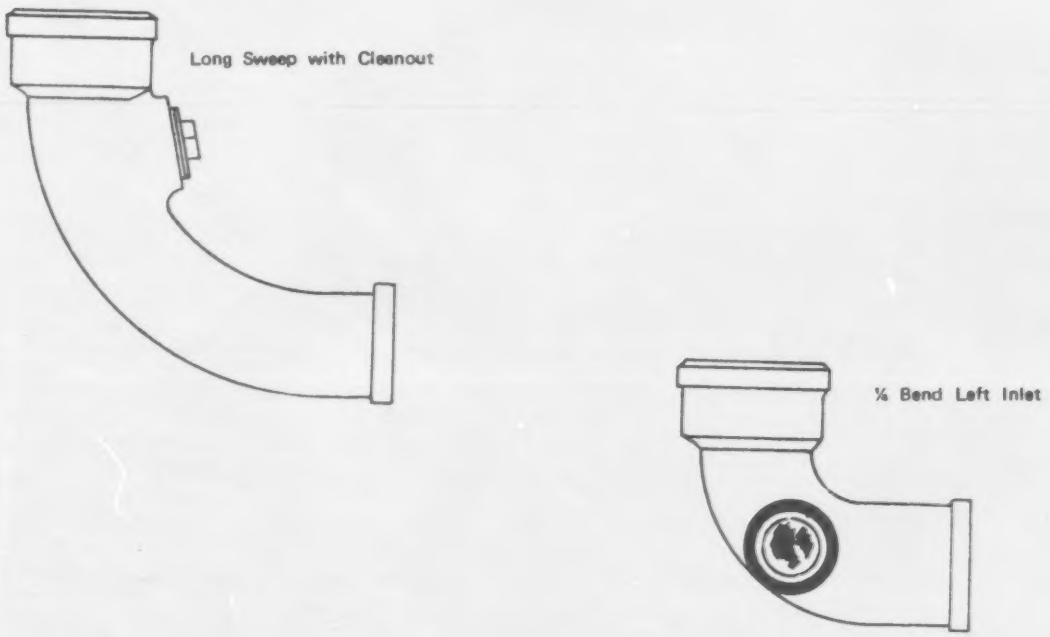
Figure 4: Quarter Bend Patterns



Soil pipe bends are made in sizes to match the pipe. The bends are available in medium and extra heavy weights. A bend is specified by first giving the size then the angle. Two examples are: 4 inch quarter bend and 2 inch fifth bend.

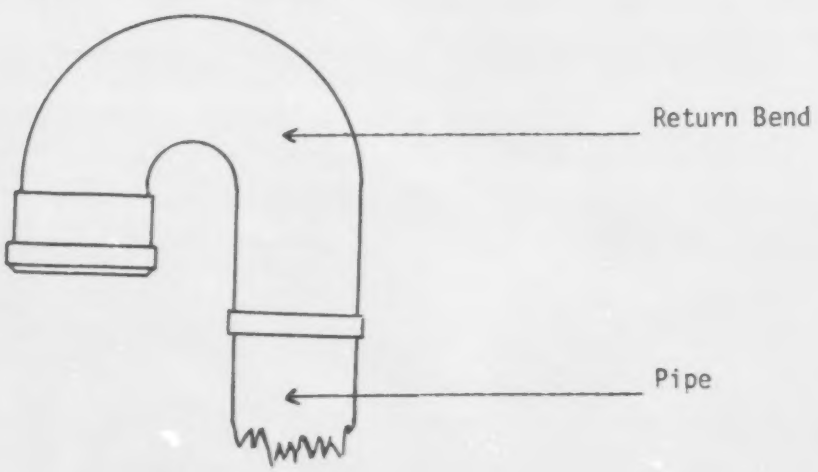
Soil pipe bends are also made with cleanouts as shown in Figure 5. To identify the right and left hand side of a soil bend look into the hub end with the spigot end down or toward you. The right side of the bend is to your right and the left side of the bend is to your left.

Figure 5: Soil Pipe Bends with Cleanouts



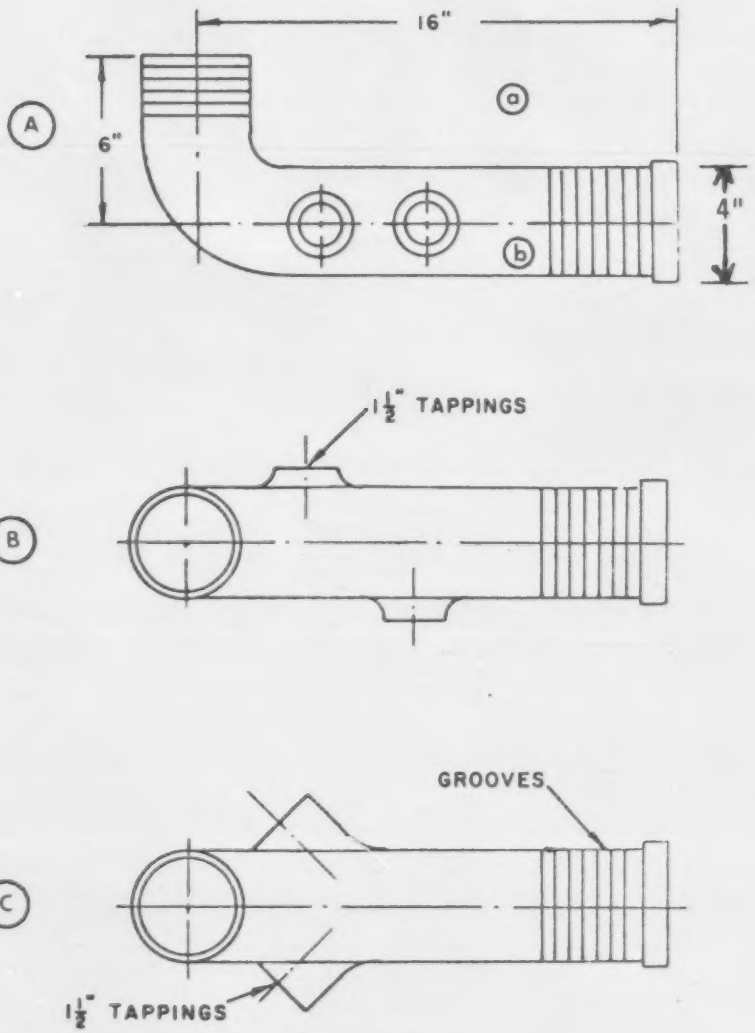
Return bends are used on fresh air inlets to keep out dirt and the like. Figure 6 is a return bend.

Figure 6: Return Bend



Closet bends and flanges are designed to connect the toilet to the waste system. A closet bend with left side tappings is shown in A of Figure 7. A closet bend with left and right tappings is shown in B of Figure 7.

Figure 7: Closet Bends



(From Related Information Plumbing II, Slater, Delmar Publishers.)

A closet bend with 45° taps is shown in C of Figure 7. Grooves at the ends of the closet bends provides for accuracy and ease of cutting.

To identify the size of closet bend desired, the pipe diameter is given first, followed by the end-to-center length of the short end and then the end-to-center length of the long end. The closet bend in Figure 7A is 4 inches by 6 inches by 16 inches.

To identify a reducing closet bend give first the short end diameter, then the long end diameter, followed by short end-to-center length and then the long end-to-center length.

A closet flange is used to attach the water closet to the closet bend. Figure 8 shows a standard closet flange (sometimes called collar) in part A and an offset flange in B.

Standard closet flanges are identified by pipe size and length. The pipe size is stated first and the length next. An example is 4 by 2 inch standard closet flange.

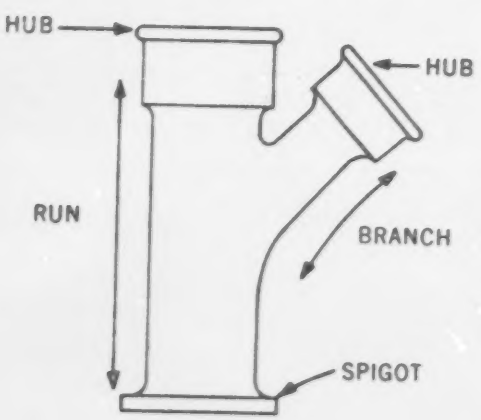
An offset closet flange is identified by the pipe size and the offset distance. The pipe size is stated first and the offset distance next. An example is 4 by 1 inch offset closet flange.

Figure 8: Closet Flanges

Wyes:

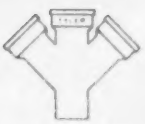
For proper sewage flow in a drainage system it is necessary to connect branches to all horizontal pipes or runs at an angle no greater than 45°. Fittings called wyes are made for that purpose. Figure 9 shows a wye with the branch and run parts labeled.

Figure 9: Wye Branch



Wyes are also made in double branches as shown in Figure 10.

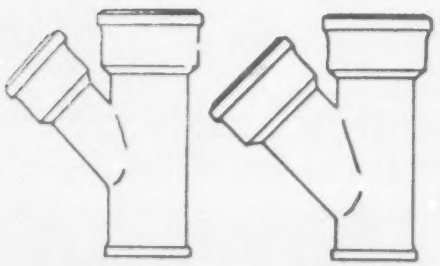
Figure 10: Double Wye Branch



Double Wye Branch

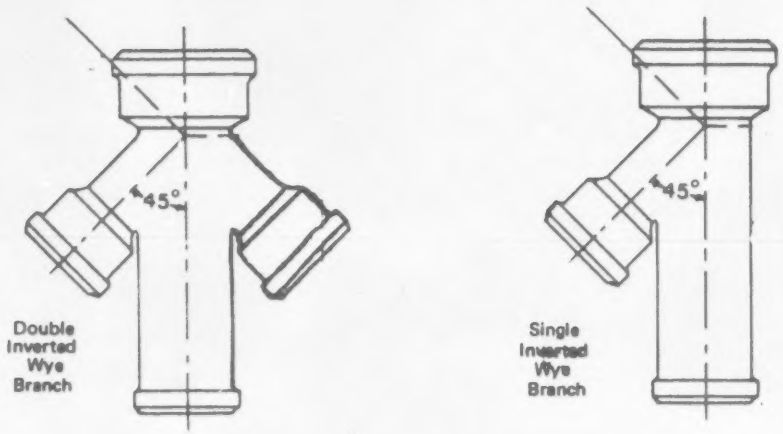
Wye branches are made in reducing and straight branches as shown in Figure 11.

Figure 11: Straight and Reducing Wye Branches



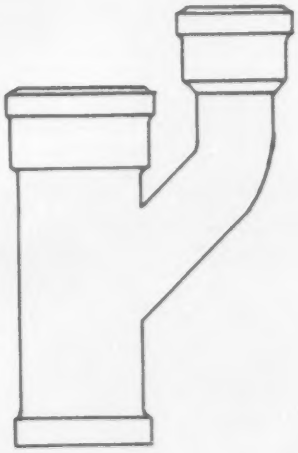
In vent stacks inverted wyes are used. These single and double inverted branch wyes are made with reducing branches. Figure 12 illustrates the inverted branch wyes.

Figure 12: Inverted Wye Branches



Upright wyes are used for the bottom of vent lines. Figure 13 shown an upright wye.

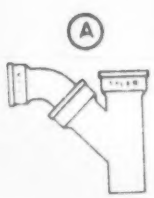
Figure 13: Upright Wye



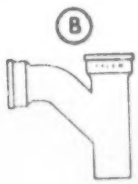
Combinations:

Combination soil fittings are made to reduce the number of joints in waste systems. This results in saving installation time and perhaps space. A combination fitting takes the place of two standard fittings. The most commonly used example of a combination fitting is shown in Part B of Figure 14. This illustration is a combination wye and 1/8 bend and is a substitute for the standard wye branch fitting and the standard 1/8 bend fitting shown connected in Part A of Figure 14.

Figure 14: Combination Fittings



1/8 Bend & Wye Branch



Combination Wye & 1/8 Bend

No-Hub Fittings:

The functions of no-hub fittings are the same as those for the hub type. Differences exist only in the absence of hubs. Joining of the fittings takes less time when no-hub type fittings are used. Only one weight of cast is used in no-hub. Dimensioning is the same as hub type fittings.

2. Read pages 61-74 in Related Information Plumbing 1.
3. Go to cast iron fittings workstation.
4. Select the box of assorted bends, wyes and combination fittings.
5. Write the description and function for each of the numbered fittings in the box on the attached Fittings Identification form.
6. Check answers with the answer key.
7. If all are correct, take the LAP test. If not, proceed as directed by the instructor.
8. Score the LAP test and return it.
9. When the LAP test is completed satisfactorily, begin the next assigned LAP. If not, proceed as directed by the instructor.

FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Student: _____ File Code: 73.01.01.03.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
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LAP TEST: JOINING SOIL PIPE AND FITTINGS/SOIL PIPE BENDS, WYES AND COMBINATIONS

73.01.01.02

1. What are the two methods used to join hub type soil pipes and fittings?

   a. Caulked lead and hub gasket.
   b. Hub gasket and cementing.
   c. Welding and caulked lead.
   d. Hub gasket and welding.

2. What color must the lead be before it is ready to be poured?

   a. An orange tinge.
   b. A reddish tinge.
   c. A white tinge.
   d. A bluish tinge.

3. Lead caulked joints are usually the easiest to make when pipes are in which of the following positions?

   a. Vertical.
   b. Horizontal.
   c. Diagonal.
   d. Either the horizontal or vertical.

4. What is the purpose of using a joint runner when making a lead joint in the horizontal position?

   a. To provide extra support for the joint.
   b. To provide insulation for the joint against the heat of the molten lead.
   c. To retain the molten lead around the joint.
   d. To decrease the amount of time needed to cool the molten lead.

5. Which type of joining method takes the least time to assemble?

   a. Hub gasket.
   b. Lead caulking.
   c. Welding
   d. No-hub connection.

73.01.01.03

6. Which of the following is one of the five (5) different bends available in soil pipe?

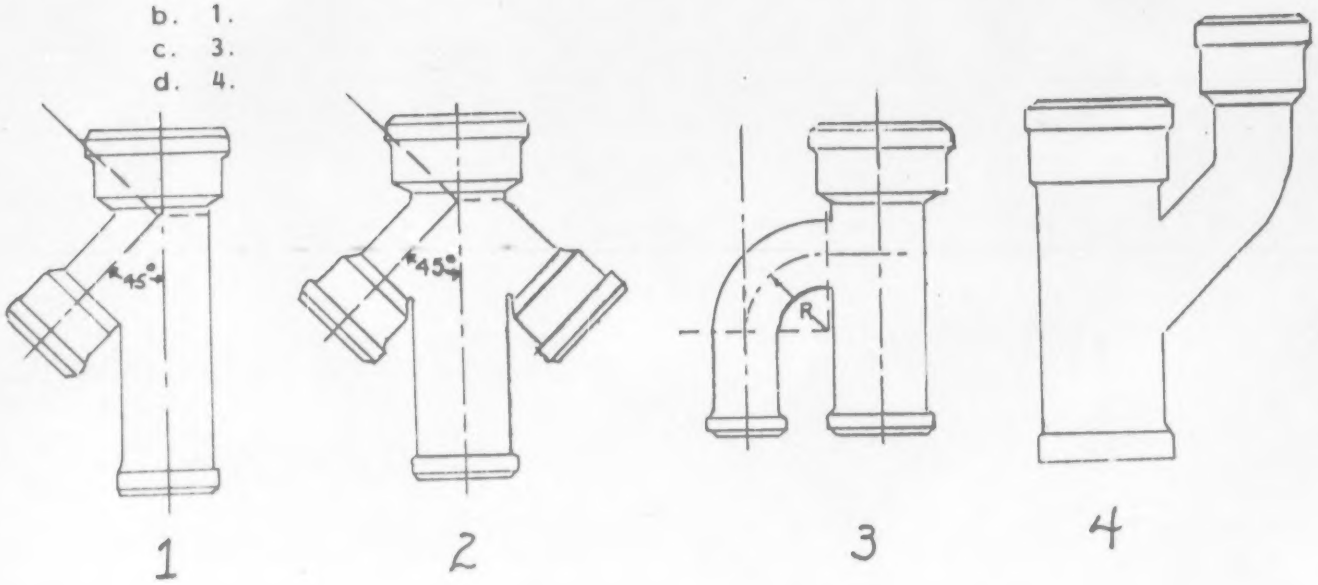
   a. 1/15.
   b. 1/3.
   c. 1/7.
   d. 1/4.

7. Soil pipe bends are available in which of the following sizes?

   a. Heavy and extra heavy weights.
   b. Light and medium weights.
   c. Medium and heavy weights.
   d. Both medium and heavy weights.

8. A single inverted wye branch is illustrated by which of the following figures?

   a. 2.
   b. 1.
   c. 3.
   d. 4.



9. In how many patterns are quarter bends available?

   a. 2.
   b. 3.
   c. 4.
   d. 1.

10. In degrees, a quarter bend is 1/4 of 360 degrees or:

    a. 90 degrees.
    b. 80 degrees.
    c. 45 degrees.
    d. 180 degrees.

LAP TEST ANSWER KEY: JOINING SOIL PIPE AND FITTINGS/SOIL PIPE BENDS, WYES AND COMBINATIONS

LAP .02

1. A
2. D
3. A
4. C
5. D

LAP .03

6. D
7. D
8. B
9. B
10. A

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Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Soil Pipe Tees and Offsets

OBJECTIVE:

Identify by size, function and type of joint the various soil pipe tees and offset fittings.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 test items on a multiple-choice objective test.

RESOURCES:

Assortment of cast iron soil pipe tees and offsets.

PROCEDURE:

1. Read the following:

In this activity the ability to identify soil pipe tees and offsets is desired. To assist in identification, descriptions and illustrations will be provided for tees and offsets. The function of the tees and offsets will also be provided. After reading about the fittings, experience in actually identifying soil tees and offsets is arranged.

Hub Type Fittings:

Tees:

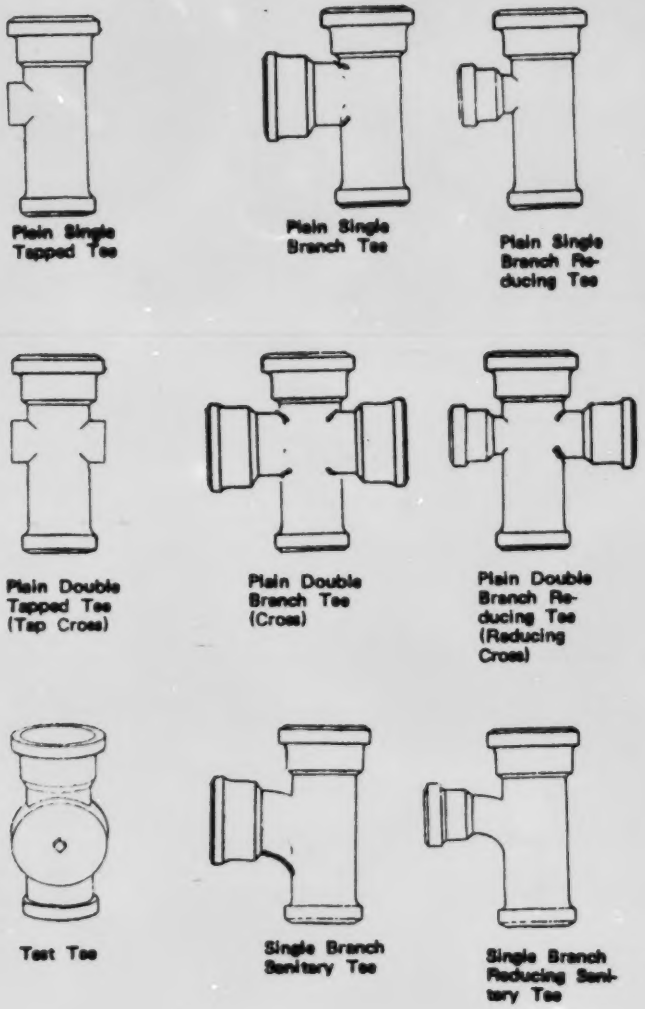
Soil pipe tees are generally used for branching in the vent systems. A tee is a 90^{o} branch fitting made in plain, sanitary, cleanout and test styles.

The plain and sanitary tees are made in single and double branch or tapped forms. Figure 1 shows the plain and sanitary single branch tees and reducing tees.

Principal Author(s): T. Bundy

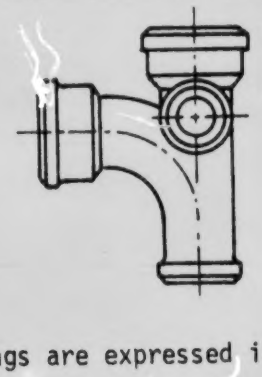
Shown also in Figure 1 are the plain and double branch tee (or cross) and the reducing tee (or reducing cross). A sanitary branch enters the run of the fitting with a gentle curve. A plain branch enters the run at 90°. Plain tees are generally used for branching in the vent system. Plain tees are also used for cleanout pupose.

Figure 1: Hub Type Soil Tees


Plain Single Tapped Tee
Plain Single Branch Tee
Plain Single Branch Reducing Tee
Plain Double Tapped Tee (Tap Cross)
Plain Double Branch Tee (Cross)
Plain Double Branch Reducing Tee (Reducing Cross)
Test Tee
Single Branch Sanitary Tee
Single Branch Reducing Sanitary Tee

Sanitary tees are used for branching in the waste system. There sanitary tees are used in vertical soil stacks. The downward curve of the entering branch causes any entering water to naturally flow downward as it enters the stack. This avoids disturbing any existing flow in the soil stack. Plain and sanitary tees are available with right and left side inlets. An example of a sanitary tee with a right-hand side inlet is shown in Figure 2.

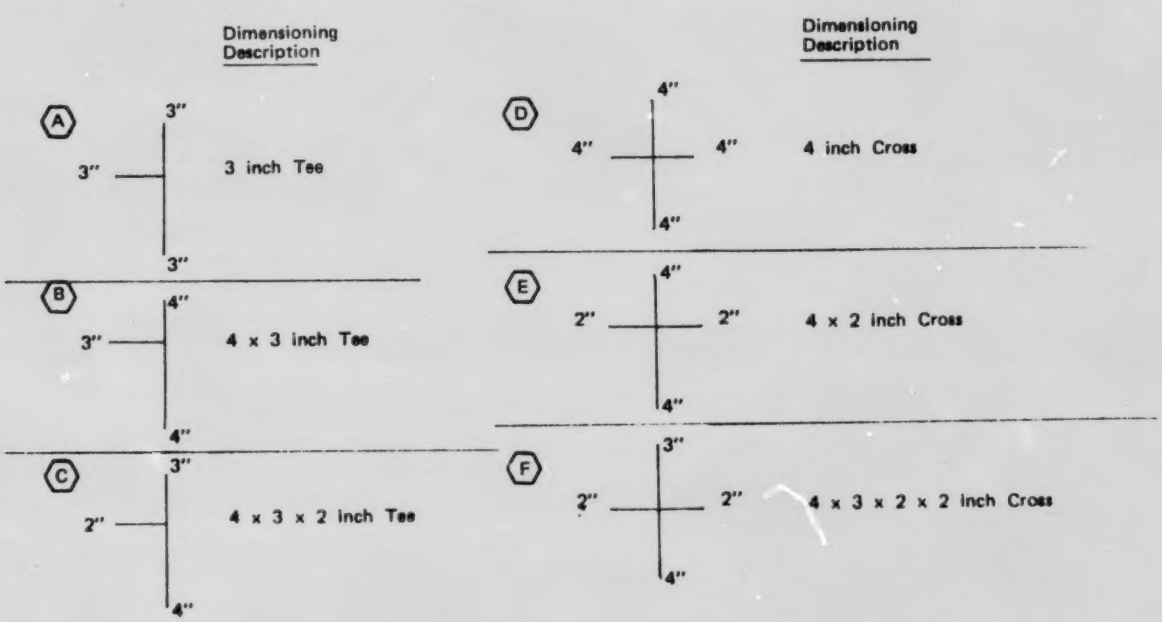
Figure 2: Sanitary Tee with Right-hand Inlet



The size of tees like other fittings are expressed in terms of the diameter of the pipe to which they connect.

Tees have branches and the first dimension stated refers to the run size. Figure 3 shows several examples of dimensions descriptions and the tee arrangement. Note that if the branch and run pipe size are alike only one dimension is given. If the branch size is different as in B of Figure 3, the run dimension is given first followed by the branch dimension. If the run size is reducing, the larger dimension is given first followed by the smaller run dimension and then followed by the branch dimension. See C in Figure 3 as an example.

Figure 3: Dimensioning Tees



For double branch tees or crosses the run size is given first like the single branch tees. Compare the dimensioning description and the cross arrangements in D, E and F of Figure 3. Note that when all sizes are alike only one dimension is given. When the branch sizes are different from the run sizes, the run dimension is stated first followed by the branch size as in part E of Figure 3. When the run size is reducing, the larger run dimension is given first followed by the smaller one. After the run dimension, both branch dimensions are given as shown in F of Figure 3.

The sanitary tee shown in Figure 2 would be identified as a 4 inch sanitary tee with a 2 inch right-hand inlet. Tees with side openings are described the same way as explained for those without side outlets and add, "with" the side opening direction and diameter of the pipe that fits into it.

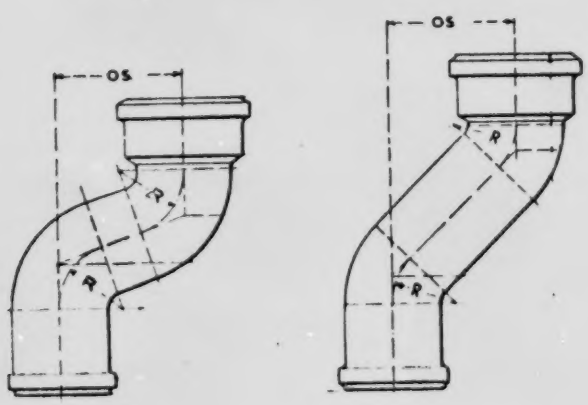
Test tees (see Figure 1) are used to place plugs in the drainage system. The plug will make a water-tight seal so that the drainage system may be filled with water. This is a test to determine if the system leaks. If the water level is maintained for a satisfactory period of time the system is considered leak free. If it does not, a search for the leak is made and corrected.

Cleanout tees and test tees are basically the same. A test tee opening is as large as the pipe run. A cleanout need not necessarily be that large. The purpose of the cleanout is to provide easy openings to the drainage system to clear any stoppages that could occur.

Offsets:

Soil pipe offset fittings are made in two styles. The straight offset and the 1/8 bend offset are shown in Figure 4. Offsets are used to avoid obstructions that come in line with a pipe like beams and windows. To identify the size of an offset, the diameter of the pipe is given first and followed by the amount of offset dimension OS in Figure 4.

Figure 4: Cast-Iron Soil Pipe Offset



Straight Offset

1/8 Bend Offset

No-Hub Fittings:

The functions of no-hub tees and offset fittings are the same as those for the hub type fittings. The only difference is the absence of hubs. Joining of the fittings takes less time when no-hub type fittings are used. Dimensioning is the same as hub type pipe fittings. No-hub comes in only one weight.

2. Go to the cast iron fittings workstation.
3. Select the box of assorted tees and offset fittings.
4. Write the description and function for each of the numbered fittings in the box on the attached"Fittings Identification" form.
5. Check your answers with the answer key.
6. If all are correct, take the LAP test.
7. Score the LAP test and return it.
8. When the test is corrected satisfactorily, begin the next LAP. If not satisfactory, proceed as directed by the instructor.

FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

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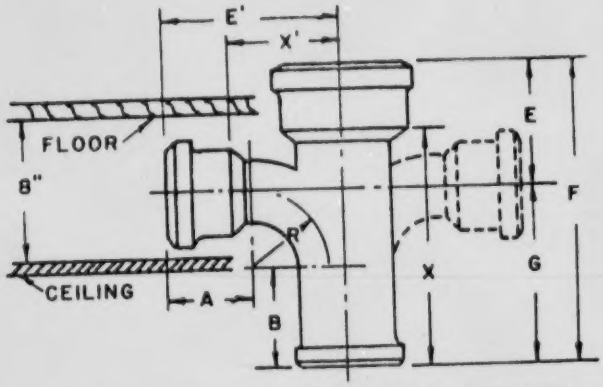
LAP TEST: SOIL PIPE TEES AND OFFSETS

1. Why does a test tee have a larger branch?

   a. To increase the fluid flow.
   b. To allow space for inserting a proving plug.
   c. To decrease fluid flow.
   d. To adapt to more sizes of fittings.

THE FOLLOWING ILLUSTRATION AND CHART ARE TO BE USED FOR THE NEXT TWO QUESTIONS:



SINGLE & DOUBLE SANITARY "T" BRANCHES

SIZE	A	B	E	E^1	F	G	R	X	X^1	Weight Single	Weight Double
2	$2\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$5\frac{1}{4}$	$10\frac{1}{2}$	$6\frac{1}{4}$	$2\frac{1}{2}$	8	$2\frac{3}{4}$	8	11
3	$3\frac{1}{4}$	4	$5\frac{1}{4}$	$6\frac{3}{4}$	$12\frac{3}{4}$	$7\frac{1}{2}$	$3\frac{1}{2}$	10	4	16	21
4	$3\frac{1}{2}$	4	6	$7\frac{1}{2}$	14	8	4	11	$4\frac{1}{2}$	22	29
5	$3\frac{1}{2}$	4	$6\frac{1}{2}$	8	15	$8\frac{1}{2}$	$4\frac{1}{2}$	12	5	28	36
3 × 2	3	4	$4\frac{3}{4}$	$6\frac{1}{2}$	$11\frac{3}{4}$	7	3	9	4	14	18
4 × 2	3	4	5	7	12	7	3	9	$4\frac{1}{2}$	17	21
4 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{1}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	$4\frac{1}{2}$	20	25
5 × 2	3	4	5	$7\frac{1}{2}$	12	7	3	9	5	20	24
5 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{3}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	5	23	28

2. What is the distance from the center of the branch to the top of the bell on a 5 inch sanitary tee?

   a. 5 1/2".
   b. 6".
   c. 6 1/2".
   d. 7".

3. What is the distance of a 5 inch sanitary tee from the center of the run to the end of the branch?

   a. 8".
   b. 8 1/2".
   c. 7 1/2".
   d. 7".

THE FOLLOWING QUESTIONS (4-10) REFER TO THE ILLUSTRATIONS ON THE NEXT PAGES:

4. What is the overall length of a 5" x 6" 45 degree offset?

   a. 16 1/2".
   b. 18 1/2".
   c. 5 9/16".
   d. 14 1/2".

5. Dimension "H" on a 6" x 2" 45 degree offset is:

   a. 2 3/8".
   b. 5 5/8".
   c. 4".
   d. 6".

6. What is the radius of a 5" x 4" 45 degree offset?

   a. 6".
   b. 3 1/2".
   c. 3 3/4".
   d. Not determinable from information on charts.

7. What is the vertical distance between centers of a 4" x 8" medium 45 degree offset?

   a. 8".
   b. 9 1/2".
   c. 14".
   d. 8 3/4".

8. What is the distance in inches from the end of the hub of a 2" x 2" 45 degree offset to the beginning of the first angle?

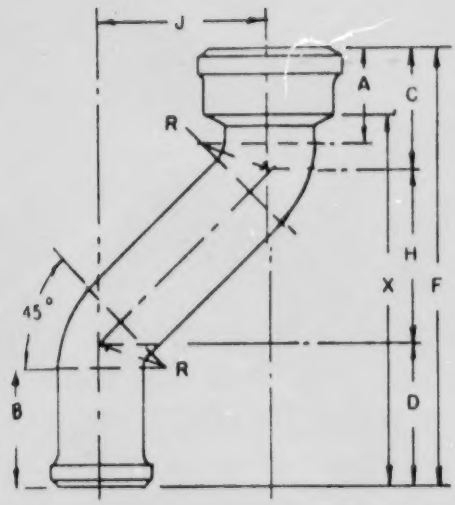
   a. 4 1/4".
   b. 3 1/2".
   c. 2 3/4".
   d. 6".

9. What is the radius of a 6" x 4" 45 degree offset?

   a. 3".
   b. 3 1/2".
   c. 4".
   d. 2 1/2".

10. What is the radius of a 2" x 2" 60 degree offset?

    a. 2".
    b. Cannot be determined from charts provided.
    c. 2 1/2".
    d. 3".



1/8 BEND OFFSET

In the tables which follow, note that:

1. All dimensions are given in inches.
2. Weights are given in pounds.
3. Dimension X is the laying length.

CHARTS

2-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
2 × 2	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$9\frac{3}{4}$	2	2	2	$7\frac{1}{4}$	5
2 × 4	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$11\frac{3}{4}$	4	4	2	$9\frac{1}{4}$	6
2 × 6	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$13\frac{3}{4}$	6	6	2	$11\frac{1}{4}$	8
2 × 8	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$15\frac{3}{4}$	8	8	2	$13\frac{1}{4}$	9

3-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
3 × 2	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$11\frac{1}{4}$	2	2	$2\frac{1}{2}$	$8\frac{1}{2}$	10
3 × 4	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$13\frac{1}{4}$	4	4	$2\frac{1}{2}$	$10\frac{1}{2}$	12
3 × 6	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$15\frac{1}{4}$	6	6	$2\frac{1}{2}$	$12\frac{1}{2}$	14
3 × 8	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$17\frac{1}{4}$	8	8	$2\frac{1}{2}$	$14\frac{1}{2}$	16

4-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
4 × 2	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	12	2	2	3	9	14
4 × 4	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	14	4	4	3	11	16
4 × 6	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	16	6	6	3	13	19
4 × 8	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	18	8	8	3	15	21

CHARTS

5-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
5 × 2	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$12\frac{1}{2}$	2	2	$3\frac{1}{2}$	$9\frac{1}{2}$	17
5 × 4	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$14\frac{1}{2}$	4	4	$3\frac{1}{2}$	$11\frac{1}{2}$	21
5 × 6	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$16\frac{1}{2}$	6	6	$3\frac{1}{2}$	$13\frac{1}{2}$	24
5 × 8	$3\frac{1}{2}$	$4\frac{1}{8}$	$4\frac{15}{16}$	$5\frac{9}{16}$	$18\frac{1}{2}$	8	8	$3\frac{1}{2}$	$15\frac{1}{2}$	27

6-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
6 × 2	$3\frac{1}{2}$	$4\frac{1}{8}$	5	$5\frac{5}{8}$	13	$2\frac{3}{8}$	2	4	10	21
6 × 4	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	15	4	4	4	12	25
6 × 6	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	17	6	6	4	14	28
6 × 8	$3\frac{1}{2}$	$4\frac{1}{8}$	$5\frac{3}{16}$	$5\frac{13}{16}$	19	8	8	4	16	32

LAP TEST ANSWER KEY: SOIL PIPE TEES AND OFFSETS

1. B
2. C
3. B
4. A
5. A
6. B
7. A
8. B
9. C
10. B

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Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Miscellaneous Soil Pipe Fittings

OBJECTIVES:

Identify the types and sizes of various soil pipe fittings that are classified outside the categories of angle and branch fittings (like reducers, caulking sleeves and backwater valves). Express the purpose of these miscellaneous fittings and recognize when or where they are used.

EVALUATION PROCEDURE:

Determine the correct answers to eight out of ten items on a multiple-choice test.

RESOURCES:

Assortment of miscellaneous soil pipe fittings.

PROCEDURE:

1. Read the following:

Some of the soil pipe fittings used in drainage and vent systems are not part of the categories of fitting studied thus far. In this activity the more commonly used soil pipe fittings not identified so far will be considered. Explained in this activity will be the following:

Caulking Sleeve
Vent Cowl
Backwater Valves
Increasers and Reducers
Insertable Joints

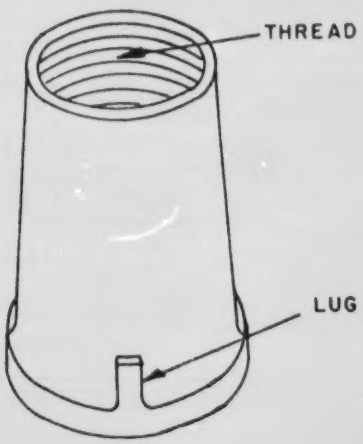
The explanations will include the purpose, types and sizes of these fittings.

Principal Author(s): T. Bundy

Caulking Sleeve:

The caulking sleeve is a common fitting. It is used to join a threaded pipe to a soil pipe hub. Figure 1 shows a caulking sleeve. The lug end is like the spigot end of hub and spigot pipe. The lug keeps the sleeve from turning when the pipe is screwed into it.

Figure 1: Caulking Sleeve

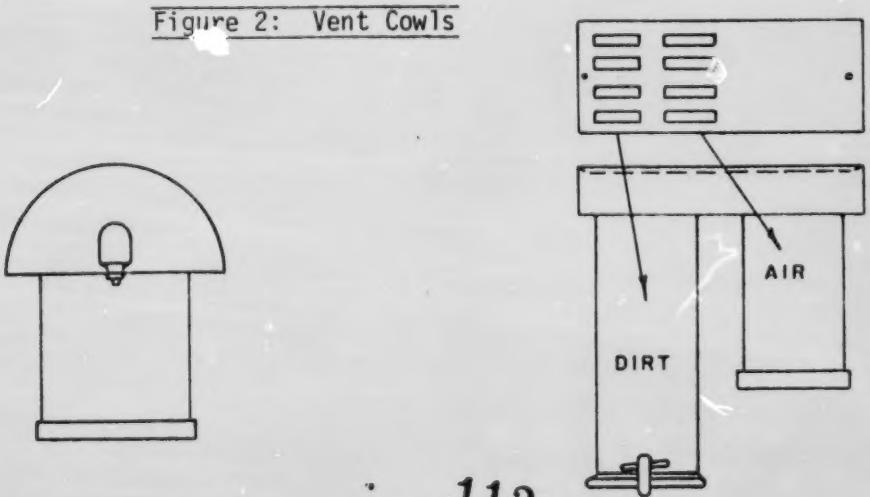


Size identification of the caulking sleeve is made by expressing the soil pipe size first and the tapped size next. A 4 by 2 caulking sleeve would fit into a 4 inch pipe hub and be tapped to accept a 2 inch threaded pipe. A similar sleeve is made to connect threaded pipe to no-hub pipe.

Vent Cowl:

Vents and soil stacks are covered with a hood-like device called a cowl. The cowl prevents down drafts and protects the vent or stack from having objects and dirt falling into it. Figure 2 illustrates two kinds of vent cowls. The size of cowls are expressed by the diameter of the soil pipe to which it is attached.

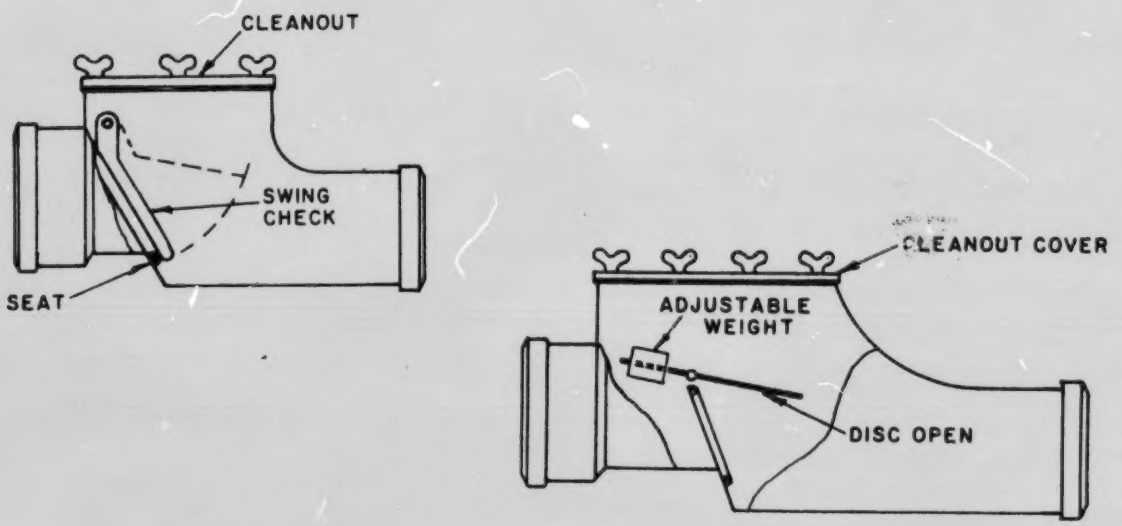
Figure 2: Vent Cowls



Backwater Valves:

Backwater valves are used in drainage systems to prevent sewage from flowing backward in the system. Two basic types of backwater valves are available. The swing type and balanced type are shown in Figure 3. The swing type has a hinged disc that closes tightly against a seat when the flow begins in the wrong direction. The balanced type of backwater valve has the disc balanced on one end of an arm. The weight on the arm is adjusted to keep the valve open under normal use.

Figure 3: Backwater Valves



When the flow begins in the wrong direction, the disc closes preventing the flow into the drainage system from outside.

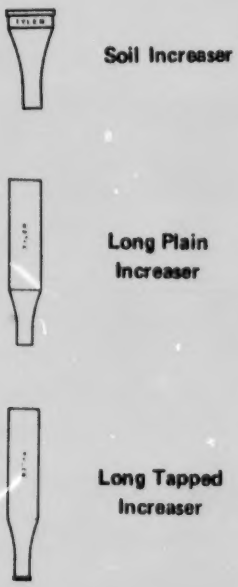
Size of backwater valves match the diameter of the soil pipe used.

Increasers and Reducers:

Pipe increasers are used at the end of vents. Enlarging the vent opening in cold climate prevents it from frosting closed. Closing of the vent will cause siphonage of trap seals in the drainage system. Loss of trap seal will permit sewer gas to enter the building.

Examples of increasers are shown in Figure 4. One type of increaser is tapped on the small end to screw on threaded pipe. Another type is plain that fits into a no-hub coupling or soil pipe hub. A long type increaser is made that increases the vent diameter and is long enough to not require additional pipe for the part above the roof. These long increasers come in both plain and tapped styles.

Figure 4: Pipe Increasers



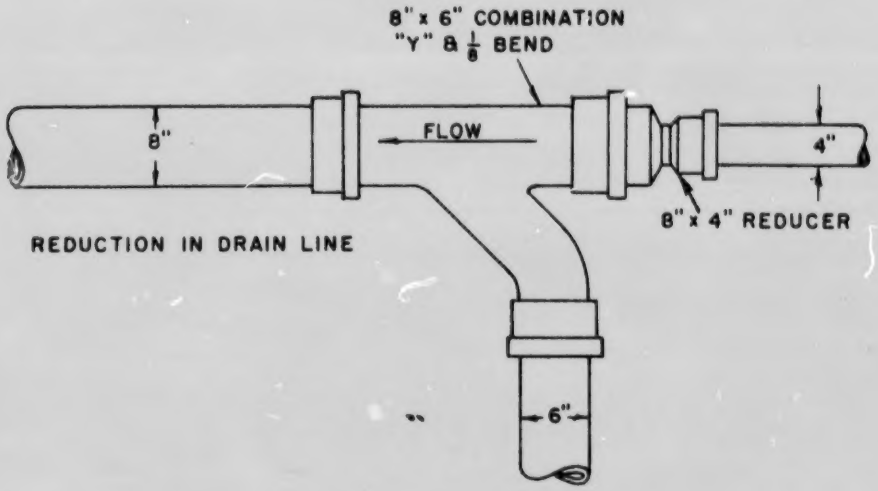
Identification of increaser sizes follows:

A soil increaser small end pipe size is stated first followed by the pipe diameter size at the larger end.

A long increaser small end pipe diameter is stated first followed by the large end diameter and followed by the length of the increaser.

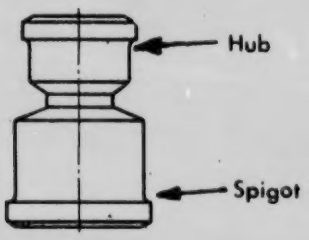
Soil pipe reducers are used to reduce the size of large drains when capacity of the system changes. Usually past the larger drainage branches the capacity requirements change and the reducer is used to change to a smaller soil pipe at that point. This is illustrated in Figure 5.

Figure 5: Use of a Soil Pipe Reducer



The larger spigot end of the reducer (See Figure 6) is placed in the hub of the pipe or fitting to be reduced. The smaller hub end of the reducer accepts the pipe or fitting for the reduced drain run or branch.

Figure 6: Soil Pipe Reducer



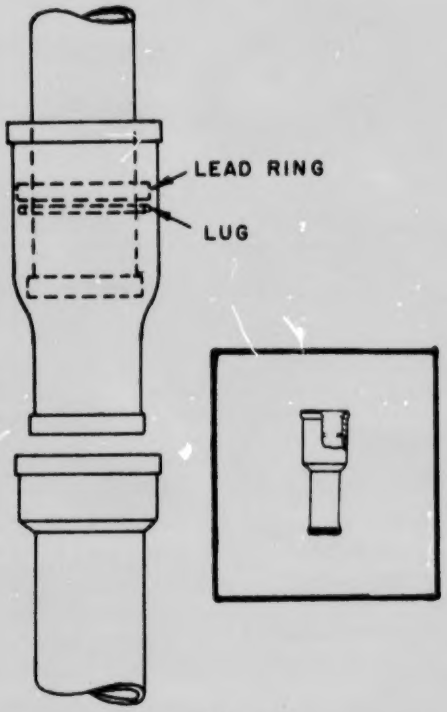
When stating the size of the soil reducer, give the large end pipe size followed by the small end pipe size.

Insertable Joints:

Repair work and alterations to hub-type soil pipe often requires inserting pipe and fittings in an existing line. Because hub-type cast iron soil pipe has deep hubs and the pipe is not flexible, repair is difficult. Special fittings have been designed for solving this problem.

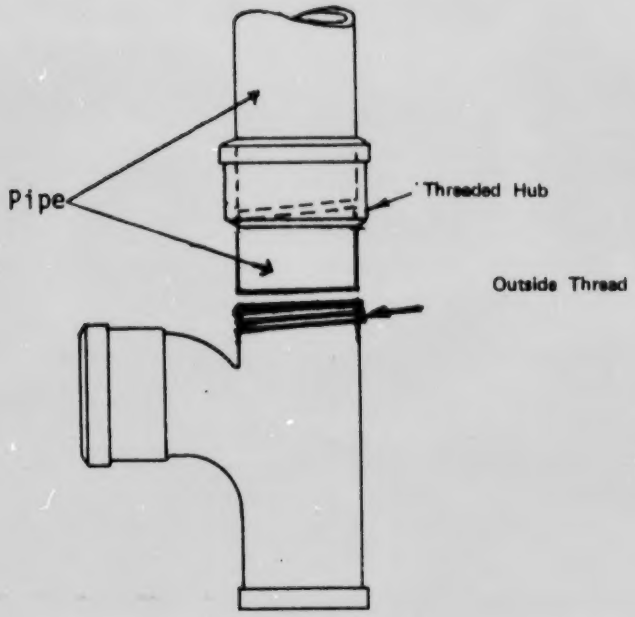
One special fitting is the Sisson Insertable Joint. The Sisson Insertable Joint is shown in Figure 7. It is an extra long hub with a lug inside as shown in the Figure 7 inset. A lead ring is used as part of the joint and is placed on the length of pipe that goes into the joint as shown in Figure 7.

Figure 7: Sisson Insertable Joint



Another special fitting to join existing lines is the Kaffer Tee. The Kaffer Tee is shown in Figure 8. A threaded hub is slipped on the pipe to be joined. When assembled as shown in Figure 8, the threaded hub is slipped down the pipe and screwed in the tee. The joint is then ready for oakum and lead caulking.

Figure 8: Kaffer Tee Joint



2. Go to the soil pipe workstation.
3. Select the box of assorted miscellaneous soil pipe fittings.
4. Write the description and function for each of the numbered fittings in the box on the attached "Fitting Identification" form.
5. Check your answers with the answer key.
6. If all are correct take the LAP test.
7. Score the LAP test and return it.
8. If satisfactory, begin the next assigned LAP.

FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Student: _____ File Code: 73.01.01.05.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: MISCELLANEOUS SOIL PIPE FITTINGS

1. Which of the following soil pipe fittings is used to join a threaded pipe to a soil pipe hub?

   a. Caulking sleeve.
   b. Vent cowl.
   c. Backwater valve.
   d. Pipe increaser.

2. A pipe reducer is used to:

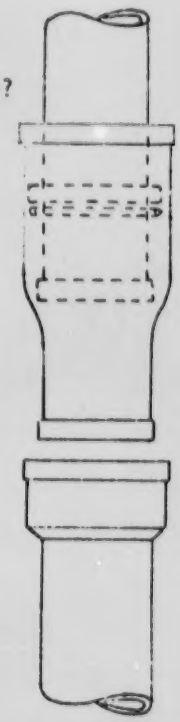
   a. prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
   b. enlarge the vent opening in cold climates to prevent it from frosting closed.
   c. join a threaded pipe to a soil pipe hub.
   d. decrease the size of large drains when the capacity of the system changes.

3. Which of the following soil pipe fittings is used to prevent sewage from flowing back into the system?

   a. Vent cowl.
   b. Insertable joint.
   c. Backwater valve.
   d. Pipe reducer.

4. What type of soil pipe fitting is illustrated below?

   a. Pipe reducer.
   b. Pipe increaser.
   c. Insertable joint.
   d. Caulking sleeve.



5. A pipe increaser is used to:

   a. enlarge the vent opening in cold climates to prevent it from frosting closed.
   b. prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
   c. decrease the size of large drains when the capacity of the system changes.
   d. join a threaded pipe to a soil pipe hub.

6. Which of the following soil pipe fittings is used to simplify hub type soil pipe repair work and alterations?

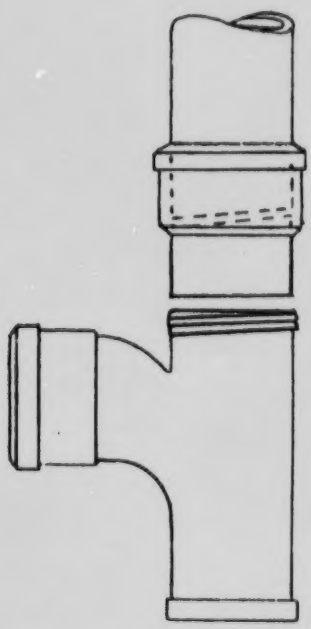
   a. Backwater valve.
   b. Vent cowl.
   c. Pipe increaser.
   d. Insertable joint.

7. A vent cowl is used for which of the following purposes?

   a. Decrease the size of large drains when the capacity of the system changes.
   b. Enlarge the vent opening in cold climates to prevent it from frosting closed.
   c. Prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
   d. Join a threaded pipe to a soil pipe hub.

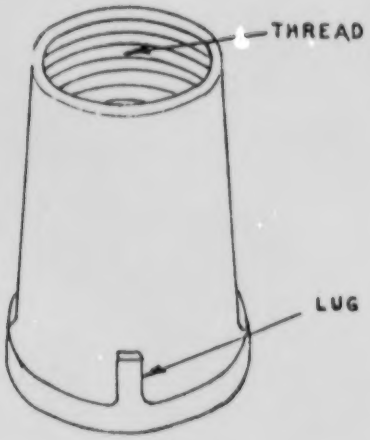
8. Which of the following special soil pipe fittings is illustrated below?

   a. Sisson insertable joint.
   b. Kaffer tee.
   c. Backwater valve.
   d. Caulking sleeve.



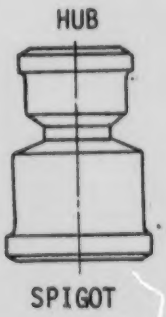
9. Which of the following soil pipe fittings is illustrated below?

   a. Pipe increaser.
   b. Insertable joint.
   c. Pipe reducer.
   d. Caulking sleeve.



10. Which of the following special soil pipe fittings is illustrated below?

   a. Kaffer tee.
   b. Pipe increaser.
   c. Caulking sleeve.
   d. Pipe reducer.



LAP TEST ANSWER KEY: MISCELLANEOUS SOIL PIPE FITTINGS

1. A
2. D
3. C
4. C
5. A
6. D
7. C
8. B
9. D
10. D

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Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Pipe Hanger Applications

OBJECTIVES:

Determine the appropriate type of hanger and method of attachment that will securely support pipes given the conditions. Identify the consideration to be used in selecting pipe hangers and attachments.

EVALUATION PROCEDURE:

Determine the correct answers to eight of ten items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read the information and view the illustrations on pages 87-89. Study with the intent to recognize and explain how and when to use hangers.
   b. Answer questions 1-10 on pages 89-91.
   c. Read pages 92-94. Study the types of hanger fasteners and methods of installation.
   d. Answer questions 1-9 on pages 94-95.
2. Check your answers with the answer key.
3. Take the LAP test.
4. Correct the LAP test and return it.
5. If satisfactory, begin the next assigned LAP.
6. If not satisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

Student: _____ File Code: 73.01.01.06.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: PIPE HANGER APPLICATIONS

1. Which of the following pipe supports is the simplest in construction?

   a. Clevis hanger.
   b. Pipe strap.
   c. Reznor hook.
   d. F. and M. hanger.

2. To support pipes in buildings that have considerable vibration, a plumber should use a:

   a. reznor hook.
   b. clevis hanger.
   c. spring cushion type hanger.
   d. split ring hanger.

3. Steel, brass or copper pipes, being rigid, must be supported about every:

   a. 10 feet.
   b. 20 feet.
   c. 15 feet.
   d. 3 feet.

4. Which of the following pipe supports should be used to hang a 4" line of wrought iron pipe?

   a. Reznor hook.
   b. Split ring hanger.
   c. Coil hanger.
   d. Clevis hanger.

5. What should a plumber use to support a flat steam coil from a wood joist?

   a. F. and M. hanger.
   b. Perforated strap iron.
   c. Coil hanger.
   d. Split ring hanger.

THE ILLUSTRATIONS PROVIDED BELOW REFER TO THE NEXT TWO QUESTIONS:

fig. #1

fig. #2

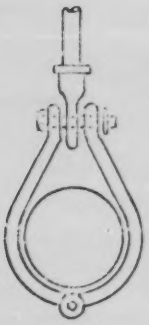

fig. #3

fig. #4

6. Which of the figures provided above illustrate a clevis hanger?

   a. 3.
   b. 1.
   c. 2.
   d. 4.

7. An F. and M. hanger is illustrated by figure number (#):

   a. 2.
   b. 1.
   c. 4.
   d. 3.

8. If a 3/4" lag screw is to be put into a wooden joist, what size hole should be bored?

   a. about 1/4".
   b. 3/4".
   c. about 3/8".
   d. about 5/8".

9. Which of the following hanger fastenings should be used to secure a hanger to a steel I-beam?

   a. A bean clamp.
   b. Lag screw.
   c. Lag bolt.
   d. Concrete insert.

10. Which of the following items is placed in a brick wall to receive a screw for a pipe support?

    a. Liquid steel.
    b. A lock nut.
    c. An expansion shell.
    d. Lag bolt.

LAP TEST ANSWER KEY: PIPE HANGER APPLICATIONS

1. C
2. C
3. A
4. D
5. C
6. C
7. D
8. C
9. A
10. C

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Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Plastic Pipe Nomenclature and Cutting

OBJECTIVES:

Identify plastic pipe by weight and size. Identify procedures for cutting plastic pipe.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test that is combined with "Plastic Angle Fittings" LAP test and taken after completing that LAP.

RESOURCES:

Related Information Plumbing 2, Slater.

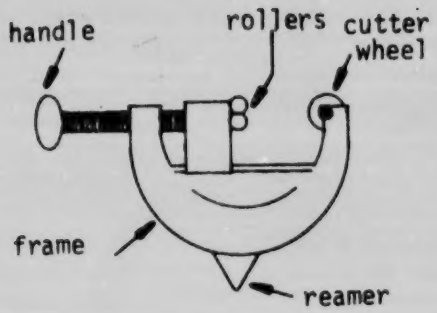
PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments:
   a. Read about the types of plastic pipe in "Plastic Pipe" on pages 16-17.
   b. Answer questions 2, 6, 9, and 12-18 on pages 18-19.
2. Check your answers using the answer key.
3. If satisfactory, read the following about cutting plastic pipe:

DIRECTIONS FOR CUTTING PLASTIC PIPE USING A PIPE CUTTER (Illustration on Page 2)

1. Adjust the space between the cutter wheel and the rollers to allow the pipe to fit between them. (The handle is turned countercloskwise to increase the opening.)
2. Position the cutter wheel at the point where the cut is desired.
3. Turn the cutter handle closkwise until the cutting wheel begins to bite into the pipe.

Principal Author(s):



4. Rotate the complete pipe cutter around the pipe. Go around the pipe twice before taking the next step.
5. Set the cutting wheel a little deeper.
6. Repeat step (4) followed by step (5).
7. Continue sequence of steps (4) and (5) until the pipe is cut through.
8. Using a reamer, ream the inside of the cut-off pipe.

DIRECTIONS FOR CUTTING PLASTIC PIPE USING A HAND SAW OR HACKSAW

1. Mark the pipe at the place to be cut.
2. Use a miter box to guide the saw for obtaining a square cut.
3. If a miter box is not available, mark all the way around the pipe and saw pipe on the line.

PROCEDURE: continued.

4. Take the LAP test.
5. Score the LAP test and return it.
6. If the LAP test is satisfactory, begin the next assigned LAP. If not satisfactory, proceed as directed by the instructor.

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Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Plastic Angle Fittings

OBJECTIVES:

Identify plastic angle fittings and recognize when and where they are used.

Complete plastic angle fitting assemblies, using appropriate tools, materials and procedures that meet given specifications.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 test items on a multiple-choice objective test.

Assembled plastic pipe angle fittings meet given specifications.

RESOURCES:

Assortment of plastic angle fittings.
Pipe cutter.
Tape measure.

PROCEDURE:

1. Read the following:

Plastic angle fittings are used to change the direction of a single pipe. Various angle fittings are available. They are shown in Figure 1. The size of plastic angle fittings is expressed in terms of the pipe size. The method of dimensioning plastic fittings is the same as for other types of drainagle fittings.

Fitting composition should match the pipe for a given installation unless special adjesives are used. (For example, PVC fittings should be used with PVC pipe.)

(Figure 1 on Page 2)

Principal Author(s):

Ted Bundy

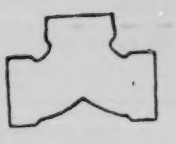
FIGURE 1: PLASTIC ANGLE FITTINGS

Short turn 90° elbow

60° elbow

45° elbow

Reducing 90° elbow



Three-way elbow
(double elbow)

2. Go to the angle fittings workstation.
3. Select the box of assorted plastic angle fittings.
4. Use the attached form "Fittings Identification" to record the description and function for each of the numbered fittings in the box.
5. Check answers with the answer key.
6. If satisfactory, have the instructor place dimensions on the attached sketch "Plastic Pipe DWV Number 1". If unsatisfactory, proceed as directed by the instructor.

7. Go to the pipe and fittings assembly workstation.

8. Assemble the pipe and fittings as shown on the sketch.

   NOTE: Do not glue joints!

9. Have instructor evaluate assembly.

10. If satisfactory, clean and return tools, clean workstation, and take the LAP test. If not satisfactory, proceed as directed by the instructor.

11. Score the LAP test and return it.

12. If satisfactory, begin the next assigned LAP. If not satisfactory, proceed as directed by the instructor.

FITTINGS IDENTIFICATION

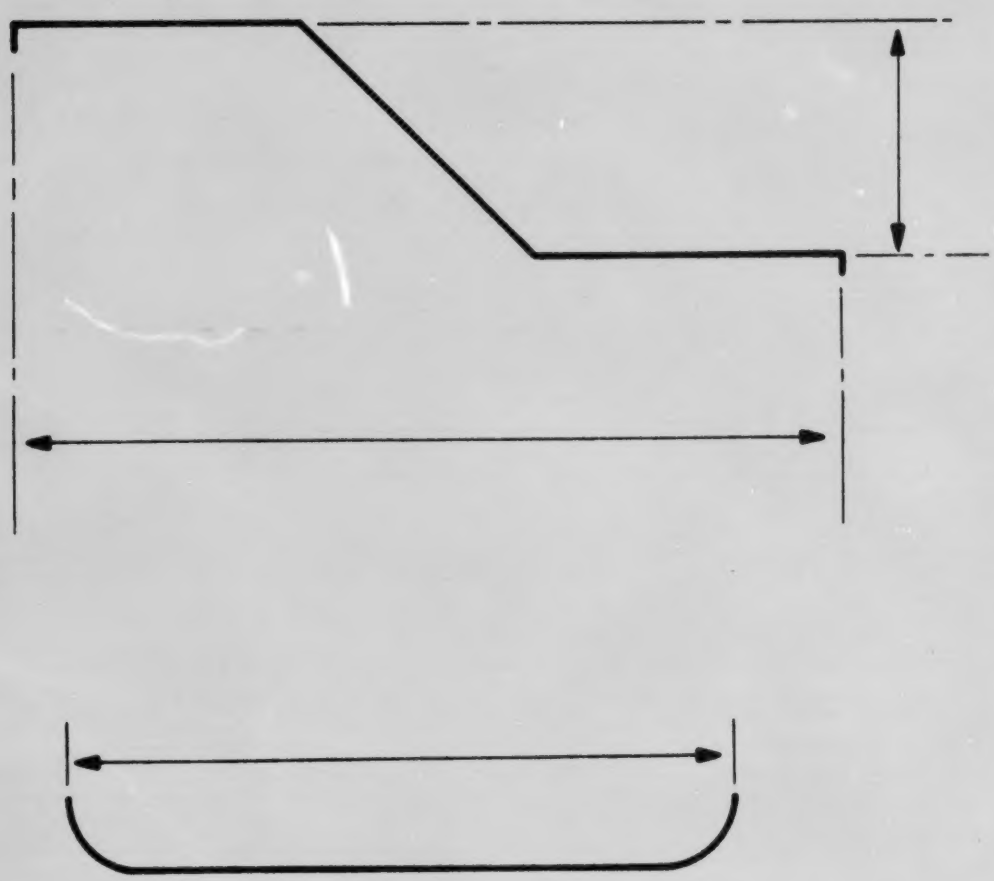
Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Sketch

Plastic Pipe DWV Number 1.



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73.01.01.07.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: PLASTIC PIPE NOMENCLATURE AND CUTTING/ PLASTIC ANGLE FITTINGS

73.01.01.07

1. Which of the following statements is not true about plastic pipe?

   a. May be bent under heat.
   b. Resists corrosion and electrolysis.
   c. Good for long runs underground.
   d. Withstands temperatures over 150 degrees Fahrenheit.

2. Why is plastic pipe not threaded with dies that have been used on steel pipe?

   a. Plastic pipe requires a softer die than does steel.
   b. Metal residue or chips can damage the plastic pipe.
   c. Worn or dull dies will not cut threads on plastic pipe.
   d. Plastic pipe requires a harder die than does steel.

3. What is the safe working pressure of 1 1/4" standard plastic pipe?

   a. 200 lbs.
   b. 250 lbs.
   c. 300 lbs.
   d. 350 lbs.

4. Plastic pipe cannot be used for circulating pipes because:

   a. it cannot adapt or join the steel fittings.
   b. it cannot withstand the pressure.
   c. it cannot withstand the temperature.
   d. it is not manufactured in the proper size for this purpose.

5. Which of the following disadvantages is the greatest for plastic pipe?

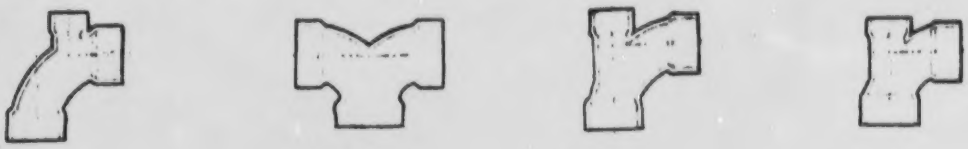
   a. Will not stand pressures over 100 to 200 lbs per square inch.
   b. Cannot withstand temperatures over 150 degrees fahrenheit.
   c. Poor expansion and contraction rate.
   d. Expensive.

73.01.01.08

6. The size of plastic angle fittings are expressed in terms of:

   a. the pipe size.
   b. construction weight.
   c. construction material.
   d. both construction weight and material.

THE FOLLOWING TWO QUESTIONS REFER TO THE ILLUSTRATION PROVIDED BELOW:



#1 #2 #3 #4

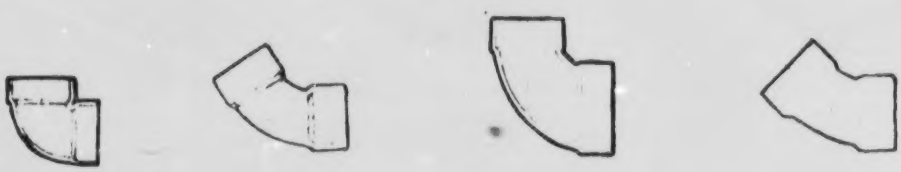
7. Figure #2 identifies a(n):

   a. 90 degree long turn Ell with a low heel outlet.
   b. three way Ell.
   c. extra long turn 90 degree Ell with a low heel outlet.
   d. extra long turn 90 degree Ell with a high heel outlet.

8. Which of the figures identifies a 90 degree long turn Ell with a low heel outlet?

   a. #2.
   b. #4.
   c. #1.
   d. #3.

THE FOLLOWING TWO QUESTIONS REFER TO THE ILLUSTRATIONS PROVIDED BELOW:



#1 #2 #3 #4

9. Which of the figures above identifies a 1/4 bend vent Ell?

   a. #2.
   b. #1.
   c. #3.
   d. #4.

10. Which of the figures on the previous page illustrates a closet bend reducing?

a. #2.
b. #4.
c. #3.
d. #1.

LAP TEST ANSWER KEY: PLASTIC PIPE NOMENCLATURE AND CUTTING/ PLASTIC ANGLE FITTINGS

LAP .07

1. D
2. C
3. A
4. C
5. C

LAP .08

6. A
7. B
8. B
9. B
10. C

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Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Plastic Branch Fittings

OBJECTIVES:

Identify plastic branch fittings by size and name.

Express the purpose for various plastic branch fittings and recognize when and where they are used.

Complete plastic branch fitting assemblies that meet the specification using appropriate tools and equipment.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test that is combined with "Miscellaneous Plastic Fittings" LAP test and is taken after completing that LAP.

Assembled plastic pipe branch fittings meet given specification.

RESOURCES:

Assortment of plastic branch fittings.
Pipe cutter.
Tape measure.

PROCEDURE:

1. Read the following:

Plastic branch fittings are used to supply branches to a run in both drainage and vent systems. Various branch fittings are available. They are shown in Figure 1 and are basically wyes and tees.

The size of plastic branch fittings is expressed in terms of the pipe size. The method of dimensioning plastic fittings is the same as for other types of drainage fittings.

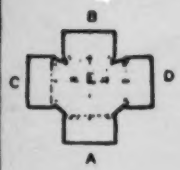
Fitting composition should match the pipe for the installation unless special adhesives are used.

(Figure 1 on Page 2)

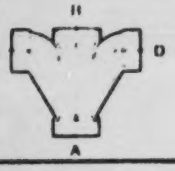
Principal Author(s):

Ted Bundy

SANITARY CROSS WITH SIDE INLET



DOUBLE FIXTURE FITTINGS



LONG TURN T-Y (Combination) Wye — ⅛ Bend

LONG TURN T-Y Reducing Wye — ⅛ Bend

LONG TURN T-Y (Combination Y and ⅛ Bend)

LONG TURN COMB (Y 1/8 BEND WITH LEFT HAND SIDE INLET)

LONG TURN COMB (Y ⅛ Bend with Right Hand Side Inlet)

DOUBLE LONG TURN T-Y

UPTURN WYE

WYE

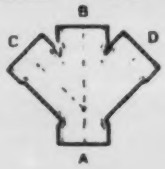
WYE

WYE

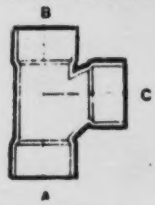
WYE

WYE

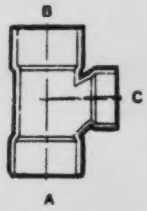
DOUBLE WYE



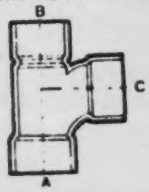
SHORT TURN T-Y (Sanitary Tee)



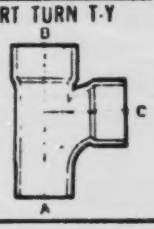
SHORT TURN T-Y Reducing (Sanitary Tee)



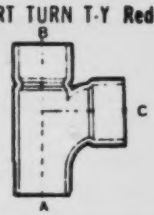
SHORT TURN T-Y Reducing



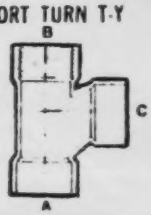
SHORT TURN T-Y



SHORT TURN T-Y Reducing



SHORT TURN T-Y



SHORT TURN T-Y Reducing

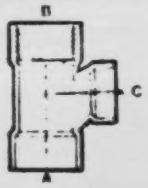


Figure 1.

2. Go to the branch fittings workstation.

3. Select the box of assorted plastic branch fittings.

4. Using the attached form "Fittings Identification," record the description and function for each of the numbered branch fittings in the box.

5. Check answers with the answer key.

6. If satisfactory, have the instructor place dimensions on the attached sketch "Plastic Pipe DWV Number 2." If unsatisfactory, proceed as directed by the instructor.

7. Go to the pipe and fittings assembly workstation.

8. Assemble the pipe and fittings as shown on the sketch.

   NOTE: Do not glue joints!

9. Have the instructor evaluate assembly.

10. If satisfactory, clean and return tools, clean the workstation, and take the LAP test. If not satisfactory, proceed as directed by the instructor.

11. Score the LAP test and return it.

12. If satisfactory, begin the next assigned LAP. If not satisfactory, proceed as directed by the instructor.

File Code: 73.01.01.10.A2-0

Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Miscellaneous Plastic Fittings

OBJECTIVES:

Identify the types and sizes of various plastic fittings that are classified outside the category of angle and branch fittings (like bushings, couplings and plugs). Express the purpose of these miscellaneous fittings and recognize when and where they are used.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

RESOURCES:

Assortment of miscellaneous plastic fittings.

PROCEDURE:

1. Read the following:

Some of the plastic pipe fittings used in drainage, waste and ventilation DWV systems are not part of the angle and branch fitting categories. In this activity the more commonly used plastic DWV fittings not identified so far are shown and named in Figure 1.

Fitting dimensions are given in terms of the pipe size. Adapters are used to change or adapt from one style of pipe or fitting to another. An example would be changing from a glued to a threaded pipe. To dimension an adapter the threaded size is given last. Couplings are used to connect two lengths of pipe. They are made in straight and reducing styles. Bushings are used to reduce the size of the opening of a fitting. In dimensioning, the larger is stated first.

Threaded plastic caps and plugs are used to temporarily close pipe openings.

Closet flanges are used to adapt the pipe to the outlet of the water closet. The large size is stated first when dimensioning a closet flange.

Principal Author(s): T. Bundy

FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

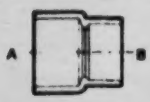
Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

ADAPTER COUPLING Adapts Plastic Sewer and Drain (CS228) Spigot To DWV Spigot

HUB ADAPTER

SPIGOT ADAPTER Adapts Cast Iron Spigot To DWV Spigot



SPIGOT ADAPTER Adapts Fiber Spigot To DWV Spigot

HUB ADAPTER Adapts Clay Hub To DWV Spigot

HUB ADAPTER Adapts Cast Iron Hub To DWV Spigot (Caulk in Ferrule)

SPIGOT ADAPTER Adapts Claypipe Spigot To DWV Spigot

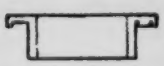
TEST CAP - DUST CAP

CAP

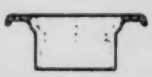
CLOSET FLANGE

CLOSET FLANGE

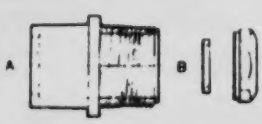
CLOSET FLANGE



CLOSET FLANGE With Adjustable Bronze Ring Hub End



MALE TRAP ADAPTER WITH NUT AND RING



FEMALE TRAP ADAPTER WITH NUT AND RING

FITTING CLEANOUT ADAPTER

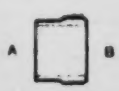
CLEAN OUT PLUG

REDUCER BUSHING

MALE ADAPTER

REDUCING MALE ADAPTER

MALE FITTING ADAPTER



FEMALE ADAPTER

REDUCER COUPLING

Figure 1.

2. Go to the miscellaneous fittings workstation.

3. Select the box of miscellaneous plastic DWV fittings.

4. Use the attached form entitled "Fittings Identification" to record the description and function for each of the numbered miscellaneous fittings in the box.

5. **Check answers with the answer key.**

6. If satisfactory, take the LAP test.

   If not satisfactory, proceed as directed by the instructor.

7. Score the LAP test and return it to the instructor.

8. If satisfactory, begin the next assigned LAP.

   If not satisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.01.10.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

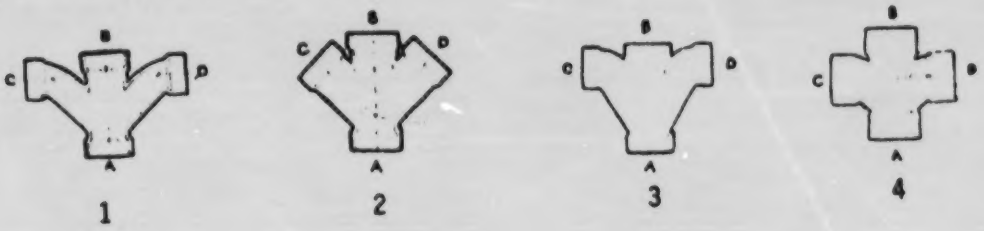
LAP TEST: PLASTIC BRANCH FITTINGS/MISCELLANEOUS PLASTIC FITTINGS

73.01.01.09

1. What is the purpose of plastic branch fittings?

   a. Supply branches to a run in vent systems only.
   b. Supply branches to a run in a hot water system.
   c. Supply branches to a run in only drainage systems.
   d. Supply branches to a run in both drainage and vent systems.

THE FOLLOWING TWO QUESTIONS REFER TO THE SET OF FIGURES BELOW:



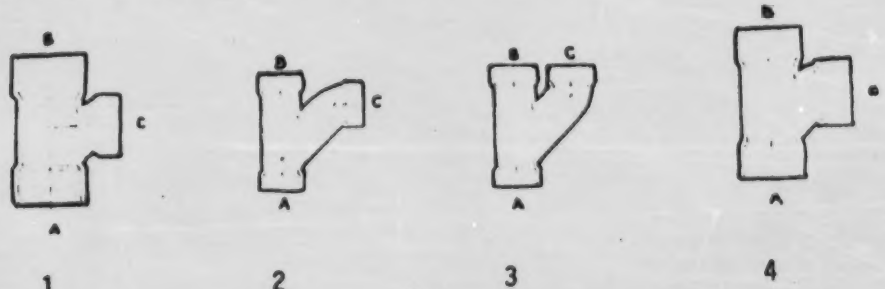
2. Which of the following correctly identifies item #1?

   a. Sanitary cross with side inlet.
   b. Double wye.
   c. Double long turn TY
   d. Double short turn TY.

3. Identify figure #3.

   a. Double short turn TY.
   b. Sanitary cross with side inlet.
   c. Double wye.
   d. Double long turn TY.

THE FOLLOWING TWO QUESTIONS REFER TO THE SET OF FIGURES SHOWN BELOW:



4. Which of the figures shown above identifies a short turn TY (sanitary tee)?

   a. #1.
   b. #4.
   c. #2.
   d. #3.

5. Identify figure #2.

   a. short turn TY reducing (sanitary tee).
   b. upturn wye.
   c. short turn TY (sanitary tee).
   d. long turn TY reducing wye (1/8 bend).

73.01.01.10

6. The plastic pipe fitting which is used to reduce the size of the opening of a fitting is called:

   a. a bushing.
   b. an adapter.
   c. a threaded plastic cap/plug.
   d. a closet flange.

7. Which of the following plastic pipe fittings is used to connect two lengths of pipe?

   a. Bushing.
   b. Coupling.
   c. Adapter.
   d. Closet flange.

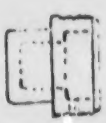
8. Which of the following listed plastic pipe fittings identifies the illustration below?

   a. Reducer bushing.
   b. Hub adapter.
   c. Spigot adapter.
   d. Male adapter.

THE FOLLOWING TWO QUESTIONS REFER TO THE ILLUSTRATION PROVIDED BELOW:

#1

#2



#3

#4

9. Identify the type of plastic pipe fitting illustrated by figure #3.

   a. spigot adapter.
   b. fitting cleanout adapter.
   c. male adapter.
   d. cleanout plug.

10. Which of the figures illustrates a spigot adapter?

   a. #4.
   b. #3.
   c. #2.
   d. #1.

LAP TEST ANSWER KEY: PLASTIC BRANCH FITTINGS/ MISCELLANEOUS PLASTIC FITTINGS

LAP .09

1. D
2. C
3. A
4. B
5. D

LAP .10

6. A
7. B
8. A
9. D
10. A

File Code: 73.01.01.11.A2-0

Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Pipe Nomenclature, Function and Threading

OBJECTIVES:

Differentiate between black pipe and certain types of pipe with regard to composition, use and size.

Set up for threading and cut a thread on a length of pipe that comforms with American Standard Pipe Thread Specifications using appropriate tools and procedures.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

Pipe threading conforms with American Standard Pipe Thread (ASPT) Specifications.

RESOURCES:

Related Information Plumbing 1, Slater.

Pipe cutter.
Pipe threader.
Pipe vice.
Reamer.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:

   a. Read "Long Pipe" on pages 5-6.

   b. Answer questions on pages 6-7. Check answers with answer key.

   c. Read pages 8-9. Study about Pipe Threads.

   d. Answer questions and make the sketch requested on pages 9-10. Check answers with answer key.

   e. Read pages 11-12. Study the set up and procedures for threading pipe.

Principal Author(s):

R. Arneson, T. Bundy, T. Frisbee

PROCEDURE: (cont.)

f. Answer the questions on pages 12-13. Check answers with answer key.

2. Have the instructor fill in the dimensions of the following pieces of "long pipe" to be cut.

Pipe	1	2	3
Type	_____	_____	_____
Size	_____	_____	_____
Length	_____	_____	_____

3. Go to the "long pipe" cutting and threading workstation.

4. Cut the pipes as listed above. All cuts are to be made within ± one eighth of an inch. Use the cutter following directions for the specific pipe cutter located at the workstation.

5. Thread the pipes on both ends following the directions referred to in Step 1. e. on page 1 and those for the specific pipe threader located at the workstation.

6. Have the instructor evaluate the three pipes.

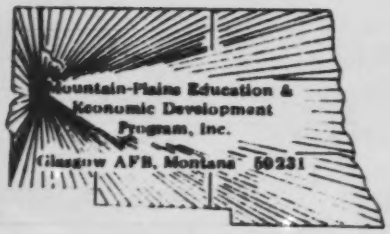
7. If satisfactory, clean workstation, clean and return tools, and take the LAP test. If not satisfactory, proceed as directed by the instructor.

8. Score the LAP test and return it.

9. If the LAP test is satisfactory, begin the next assigned LAP. If not satisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.01.11.A2-2

Date: _____ Date Published: 10-24-74



LAP TEST: PIPE NOMENCLATURE FUNCTION AND THREADING

1. Long pipe specified as O. D. is larger than:

   a. 8 inches.
   b. 10 inches.
   c. 12 inches.
   d. 6 inches.

2. A length of long pipe is apparently being standardized at about:

   a. 21 feet.
   b. 15 feet.
   c. 24 feet.
   d. 18 feet.

3. Long pipe used for water must be coated with:

   a. copper.
   b. aluminum.
   c. nickel.
   d. zinc.

4. What are the three methods of manufacturing steel pipe?

   a. Lap-weld, press-weld, and butt-weld.
   b. Butt-weld, lap-weld, and seamless.
   c. Electrolysis, chrome-moly, and seamless.
   d. Chrome-moly, electrolysis, and press-weld.

5. Neglecting to apply cutting oil when threading a pipe will result in:

   a. friction which may ruin the dies.
   b. friction which may ruin the threads being cut into the pipe.
   c. improperly threading the pipe; loss of thread sharpness.
   d. dull threads.

6. 1/4 and 3/8 inch pipe have:

   a. 18 threads per inch.
   b. 12 threads per inch.
   c. 24 threads per inch.
   d. 15 threads per inch.

7. How many dies are used in a Rigid stock?

   a. 5.
   b. 3.
   c. 4.
   d. 6.

8. Which of the following pipe threading features prevents chips from packing and spoiling the threads?

   a. Lip of the die.
   b. Cutting oil.
   c. Starting threads.
   d. Chip space.

9. Give the angle of the lip to cut brass threads.

   a. 25 degrees.
   b. 19 degrees.
   c. 32 degrees.
   d. 15 degrees.

10. What is usually the reason for poor threads in a pipe?

   a. Excessive amount of metal chips.
   b. Dull dies.
   c. Poor grade of cutting oil.
   d. The wrong size of die.

LAP TEST ANSWER KEY: PIPE NOMENCLATURE, FUNCTION, AND THREADING

1. C
2. A
3. D
4. B
5. A
6. A
7. C
8. D
9. A
10. B

File Code: 73.01.01.12.A2-0

Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Pipe Measurement, Layout and Assembly

OBJECTIVES:

Use and interpret the terminology referring to pipe measurement and layout.

Make measurements for pipe length preparation and for installation layout using the desired procedures for applying fitting allowances.

Assemble the prepared pipe according to the installation specifications using the appropriate tools and procedures.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

Prepared pipe assembly complies with given specifications.

RESOURCES:

Related Information Plumbing 1, Slater.

Pipe cutter.
Pipe threader.
Pipe vice.
Pipe wrench.
Reamer.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:

   a. Read about measuring pipe for an installation on pages 14-16.

   b. Answer questions and make requested sketch on page 16. Check answers with answer key.

   c. Read about fitting allowances on pages 17-19.

Principal Author(s):

R. Arneson, T. Bundy, T. Frisbee

PROCEDURE: (cont.)

d. Answer questions on pages 20-22. Check answers with answer key.

e. Read about procedures for assembling pipe and fittings on page 23.

f. Answer questions on pages 24-25. Check answers with answer key.

2. Label each drawing on the attached sketch "Long Pipe Assembly" using the proper pipe measurement terminology.

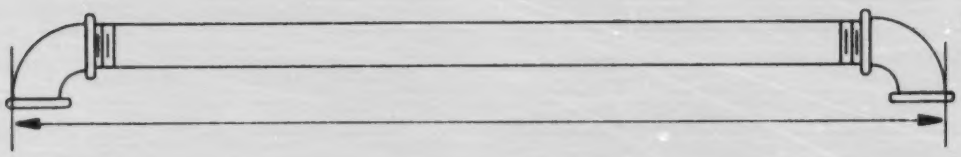
3. Have the instructor check your labeling and dimension the sketch.

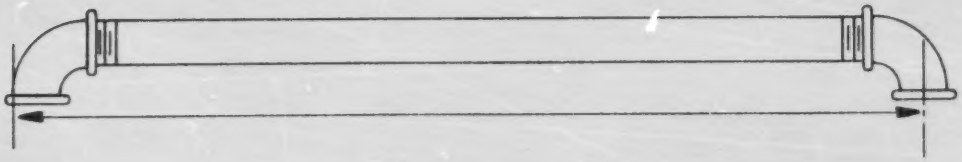
4. Assemble the pipe and fittings according to the sketch.

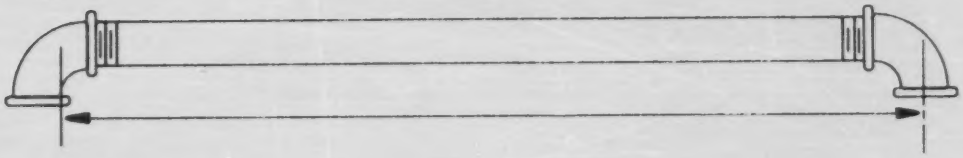
5. If satisfactory, take the LAP test. If not satisfactory, proceed as directed by the instructor.

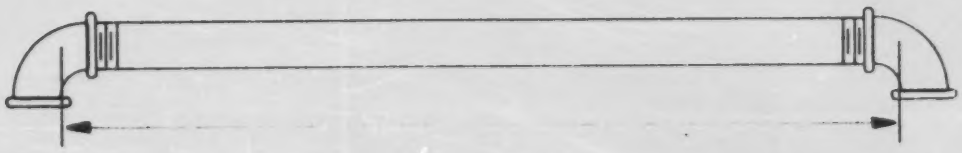
6. Score the LAP test and return it.

7. If satisfactory, begin the next assigned LAP. If not satisfactory, proceed as directed by the instructor.









Student: _____ File Code: 73.01.01.12.A2-2

Date: _____ Date Published: 10-24-74

Mountain-Plains Education & Economic Development Program, Inc.
Havre, Montana 59501

LAP TEST: PIPE MEASUREMENT LAYQUT AND ASSEMBLY

1. An end to end measurement of a 57 1/2" pipe would be how many feet and inches?

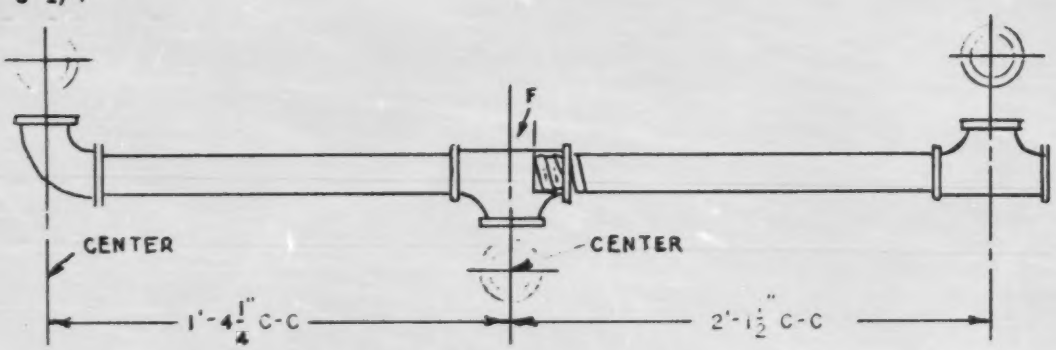
   a. 4'-10 1/2"
   b. 5'-2 1/2".
   c. 4'-8 1/2"
   d. 4'-9 1/2"

2. If two outlets are placed 4'-6" apart, what is this measurement called?

   a. face-to-face.
   b. center-to-throat.
   c. center-to-center.
   d. face-to-back.

3. What is the center to center measurement between the elbow and the end tee in the illustration below?

   a. 3' 5 3/4"
   b. 3' 4 1/2"
   c. 3' 1 1/2"
   d. 3' 5 1/4"



4. When making an end-to-center measurement, how many allowances must be made?

   a. Three fitting allowances.
   b. Two fitting allowances.
   c. One fitting allowance.
   d. Four fitting allowance.

5. A 1 1/2" pipe railing has seven posts 6'-6" center-to-center. Give the end-to-end length of pipe between the posts and the number of lengths.

   a. 8'-3 2/3" end-to-end Four (4) lengths.
   b. 6'-5 1/2" end-to-end Five (5) lengths.
   c. 5'-10 1/2" end-to-end Seven (7) lengths.
   d. 6'-5 3/8" end-to-end Six (6) lengths.

REFER TO THE CHART ON THE NEXT PAGE FOR THE FOLLOWING QUESTION:

6. The center-to-face measurement of a 1/2" malleable elbow is:

   a. 1 1/8".
   b. 7/8".
   c. 1 5/8".
   d. 1 1/4".

7. What is meant by the term "taper"?

   a. a gradual decrease in diameter.
   b. a gradual increase in diameter.
   c. a rapid decrease in diameter.
   d. a rapid increase in diameter.

8. Which of the following tools is used to tighten a brass fitting?

   a. water-pump pliers.
   b. crescent wrench.
   c. monkey wrench.
   d. open-end wrench.

9. Why should pipe dope be applied to a thread?

   a. assists in lubricating the fitting.
   b. allows the fitting to screw onto the pipe with greater ease.
   c. fills up imperfections in the threads.
   d. to prevent corrosion and rust.

10. Which of the following metals is much easier to stretch out of shape than the others?

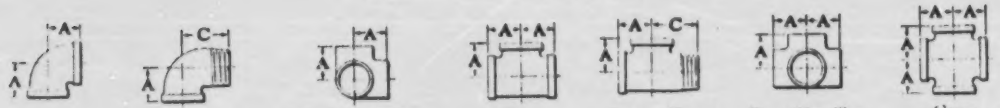
   a. brass.
   b. cast iron.
   c. steel.
   d. nickel.

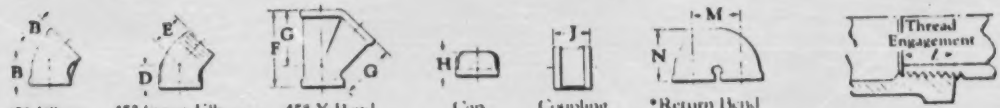
CHARTS FOR QUESTION NUMBER 6 ON THE PRECEDING PAGE:

150-Pound Malleable Iron Fittings

Dimensions of Straight Sizes, in Inches

Banded and Plain Pattern





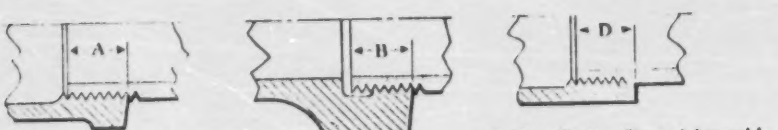
These dimensions apply to both Banded and Plain Fittings; their center to end dimensions are alike.

*Close Pattern Return Bends can not be used to make up parallel ends. The center to center dimension is so close that the bands of adjacent bends will not clear each other.

Size	A	B	C	D	E	F	G	H	J	Return Bends Close M	Close N	Medium M	Medium N	Open M	Open N	Z
⅛	11/16	½	1	11/16	13/16			9/16	15/16							¼
¼	13/16	¾	13/16	⅝	15/16			⅝	1 1/16							⅜
⅜	15/16	13/16	17/16	1 1/16	1 1/16	2⅛	1 7/16	¾	1 3/16							⅜
½	1⅛	⅞	1⅝	1 3/16	1 3/16	2 7/16	1 11/16	⅞	1 5/16	1	1¾	1¼	1⅝	1½	1⅞	½
¾	1 5/16	1	1⅞	1 5/16	1 5/16	2⅞	2	1 1/16	1½	1¼	2 3/16	1½	1 15/16	2	2¼	9/16
1	1½	1⅛	2⅛	1 7/16	1½	3⅜	2 7/16	1 5/16	1 11/16	1½	2½	1⅞	2¼	2½	2⅝	11/16
1¼	1¾	1⅝	2 7/16	1¼	1 11/16	4 1/16	2 15/16	1¼	1 15/16	1¾	2 13/16	2¼	2 13/16	3	3 3/16	11/16
1½	1 15/16	1 7/16	2 11/16	1⅜	1⅞	4½	3 5/16	1 5/16	2⅛	2 3/16	3 3/16	2 1/2	3 3/16	3½	3⅝	11/16
2	2¼	1 11/16	3¼	1 11/16	2¼	5 7/16	4	1 7/16	2½	2⅝	3⅞	3	3⅞	4	4⅜	¾
2½	2 11/16	1 15/16	3 13/16			6¼	4 11/16	1 13/16	2⅞					4½	4 15/16	15/16
3	3⅛	2 3/16	4½			7¼	5 9/16	1 15/16	3 3/16					5	5 9/16	1
3½	3 7/16	2⅜						1 15/16								1 1/16
4	3¾	2⅝	5 11/16			8⅞	6 15/16	2 1/16	3 11/16					6	6 11/16	1⅛
5	4½	3 1/16						2 5/16								1¼
6	5⅛	3 7/16						2 9/16								1 5/16

Normal Engagement

Between Male and Female Threads



American Standard and API Line Pipe Threads

Shoulder Type Drainage Fitting Threads

Railing Fitting Thread Assembly

Size of Pipe	D Length of Pipe Entering Recessed Railing Fitting
½	½
¾	½
1	⅝
1¼	11/16
1½	¾
2	¾

Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14
A	¼	⅜	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1	1 1/16	1⅛	1¼	1 5/16	1 7/16	1⅝	1¾	
B						9/16	⅝	⅝	⅝	⅞	15/16	1	1 1/16	1 3/16	1¼	1⅜	1 9/16	1 11/16	1⅞

LAP TEST ANSWER KEY: PIPE MEASUREMENT, LAYOUT AND ASSEMBLY

1. D
2. C
3. A
4. C
5. D
6. A
7. A
8. C
9. C
10. A

File Code: 73.01.01.13.A2-0

Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Drainage Angle Fitting Nomenclature, Function and Assembly

OBJECTIVES:

Identify threaded drain angle fittings by size, name and special features.

Express the purpose for the various threaded angle fittings and recognize when and where they are used.

Using a sketch, appropriate tools and procedures, construct a drain pipe assembly involving angle fittings.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

Assembled drain angle fittings meet given specifications.

RESOURCES:

Related Information Plumbing 1, Slater.

Assortment of drainage angle fittings.
Pipe cutter.
Pipe threader.
Pipe vice.
Pipe wrench.
Reamer.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about how angle fittings are measured on pages 29-30.
   b. Answer questions and make sketches requested on page 31. Check answers with answer key.

Principal Author(s):

R. Arneson, T. Bundy, T. Frisbee

PROCEDURE: (cont.)

c. Read about the features, sizes and use of drainage elbows on pages 51-52.

d. Answer questions and make requested sketch on pages 52-53. Check answers with answer key.

2. Go to the threaded drain angle fittings workstation.

3. Select the box containing an assortment of various threaded drainage angle fittings.

4. Use the attached form "Fittings Identification" to record the description and function for each of the numbered fittings in the box. Check answers with the answer key.

5. If satisfactory, have the instructor dimension the attached sketch "Threaded Drainage Angle Fittings Assembly" and proceed to the threaded drainpipe assembly workstation.

   If unsatisfactory, proceed as the instructor directs.

6. Assemble the fittings and pipe as shown on the attached sketch "Threaded Drainage Angle Fittings Assembly."

7. Have the instructor evaluate the assembly.

8. If satisfactory, clean and return tools, clean workstation, and take the LAP test. If unsatisfactory, proceed as directed by the instructor.

9. Score the LAP test and return it.

10. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as the instructor directs.

FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Student: _____ File Code: 73.01.01.13.A2-2

Date: _____ Date Published: 10-25-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: DRAINAGE ANGLE FITTING NOMENCLATURE, FUNCTION AND ASSEMBLY

1. What does the word "angle" mean?

   a. The point where two lines intersect.
   b. The distance between two lines which are not connected to one another.
   c. The distance between two parallel lines.
   d. The amount of space between two lines which are connected to one end.

2. How many degrees are there in a circle?

   a. 90 degrees.
   b. 360 degrees.
   c. 270 degrees.
   d. 180 degrees.

3. In plumbing, a "return elbow" is a:

   a. 180 degree elbow.
   b. 90 degree elbow.
   c. 270 degree elbow.
   d. 360 degree elbow.

4. When making an offset on a pipe line, a 45 degree elbow is used at the first bend. What fitting should be used for the second bend to return the pipe to its original axis?

   a. 45 degree elbow.
   b. 30 degree elbow.
   c. 60 degree elbow.
   d. 90 degree elbow.

5. How many 1/4 bends make 360 degrees?

   a. 4
   b. 3
   c. 2
   d. 6

6. What is the next size drainage elbow above and below 1 1/2"?

   a. 1 1/4" & 1 3/4".
   b. 1 1/4" & 2".
   c. 1 3/8" & 1 5/8".
   d. 1 7/16" & 1 9/16".

7. All 90 degree drainage fittings are tapped to incline the branch pipe:

   a. 1/2" per foot.
   b. 1/8" per foot.
   c. 1/4" per foot.
   d. 1/16" per foot.

8. How many 1/8 bends make 180 degrees?

   a. 4
   b. 2
   c. 6
   d. 8

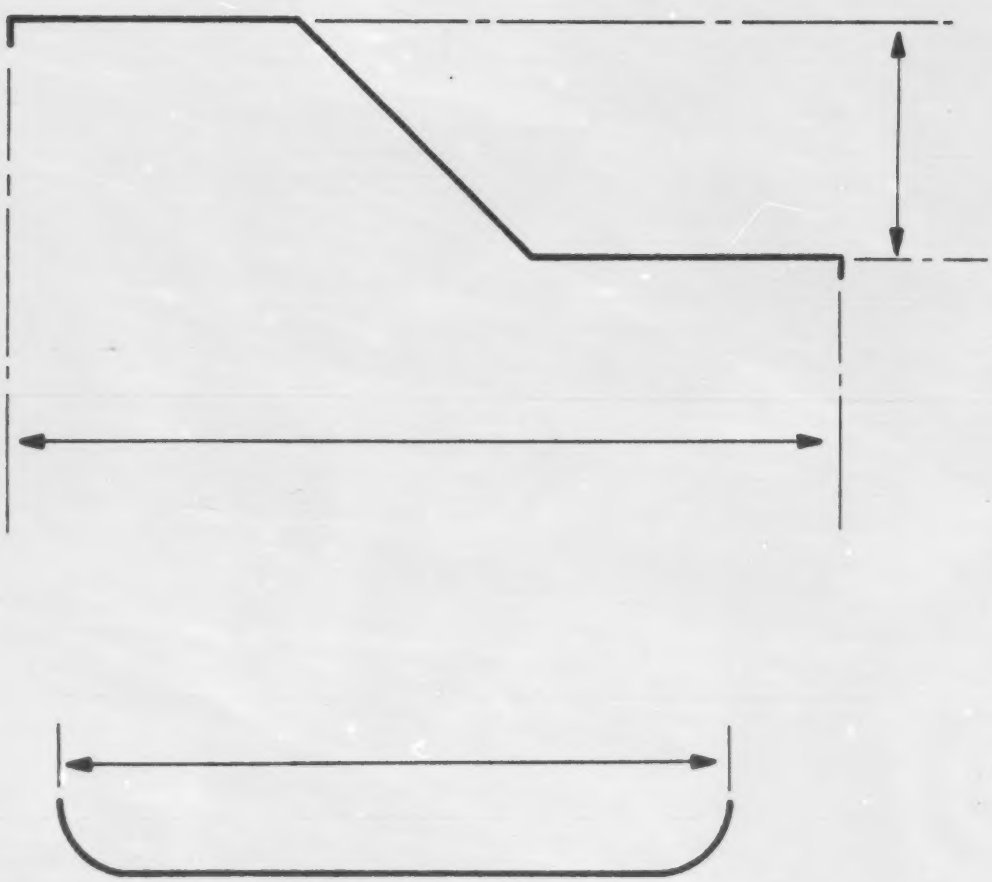
9. What is the name of the point where two lines of an angle meet?

   a. Circumference.
   b. Radius.
   c. Vertex.
   d. Diameter.

10. A pipe railing forming a square would require how many and what angle fittings?

    a. Four (4) 90 degree side outlet elbows.
    b. Two (2) 180 degree side outlet elbows.
    c. Five (5) 60 degree side outlet elbows.
    d. Ten (10) 30 degree side outlet elbows.

THREADED DRAINAGE ANGLE FITTINGS ASSEMBLY



LAP TEST ANSWER KEY: DRAINAGE ANGLE FITTING NOMENCLATURE, FUNCTION AND ASSEMBLY

1. D
2. B
3. A
4. A
5. A
6. B
7. C
8. A
9. C
10. A

File Code: 73.01.01.14.A2-0

Date Published: 7/1/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Drainage Tee Nomenclature, Function and Assembly

OBJECTIVES:

Identify threaded drain tees by size, name and special features.

Express the purpose for the threaded drain tees and recognize when and where they are used.

Construct a drain pipe assembly, involving tees, using a sketch, appropriate tools and procedures.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test that is combined with "Drainage Wye Nomemclature, Function and Assembly" LAP test and is taken after that LAP.

Assembled threaded drain tees meet given specifications.

RESOURCES:

Related Information Plumbing 1, Slater.

Assortment of drainage tee fittings.
Pipe cutter.
Pipe threader.
Pipe vice.
Pipe wrench.
Reamer.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about the sizes and kinds of drainage tees on page 54.
   b. Answer questions on page 55.
   c. Check answers with answer key.

Principal Author(s):

R. Arneson, T. Bundy, T. Frisbee

PROCEDURE: (cont.)

2. Go to the threaded drain fitting workstation.

3. Select the box of assorted threaded drain tees.

4. Using the attached form "Fittings Identification," record the description and function for each of the numbered threaded tees in the box.

5. Check answers with answer key.

6. If satisfactory, have the instructor dimension the attached sketch "Threaded Drainage Tee Assembly" and go to the threaded pipe assembly workstation.

   If unsatisfactory, proceed as the instructor directs.

7. Assemble the fittings and pipe as shown on the attached sketch "Threaded Drainage Tee Assembly."

8. Have the instructor evaluate the assembly.

9. If satisfactory, clean and return tools, clean workstation and proceed to the next LAP.

   If unsatisfactory, proceed as directed by the instructor.

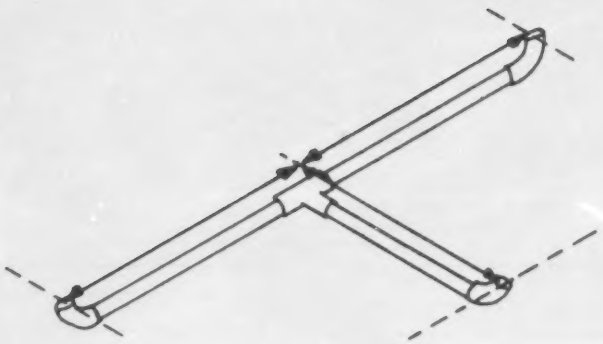
FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

THREADED DRAINAGE TEE ASSEMBLY



File Code: 73.01.01.15.A2-0

Date Published: 7/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Drainage Wye Nomenclature, Function and Assembly

OBJECTIVES:

Identify threaded drain wyes by size, name and special features.

Express the purpose for the threaded drain wyes and recognize when and where they are used.

Construct a drain pipe assembly, involving wyes, using a sketch, appropriate tools and procedures.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

Threaded drain wyes meet given specifications.

RESOURCES:

Related Information Plumbing 1, Slater.

Assortment of drainage wye fittings.
Pipe cutter.
Pipe threader.
Pipe vice.
Pipe wrench.
Reamer.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about the purpose and sizes of drainage wye brances on pages 56-57.
   b. Answer the questions and make requested sketches on pages 57-58. Check answers with answer key.
2. Go to the threaded drain fitting workstation.

Principal Author(s):

R. Arneson, T. Bundy, T. Frisbee

PROCEDURE: (cont.)

3. Select the box of assorted threaded drain wyes.

4. Using the attached form "Fittings Identification," record the description and function for each of the numbered fittings in the box. Check answers with the answer key.

5. If satisfactory, have the instructor dimension the attached sketch "Threaded Wye Assembly" and go to the pipe threading workstation. If unsatisfactory, proceed as the instructor directs.

6. Assemble the pipe and fittings as shown on the attached sketch "Threaded Wye Assembly."

7. Have the instructor evaluate the assembly.

8. If satisfactory, clean and return tools, clean workstation and take the LAP test. If unsatisfactory, proceed as directed by the instructor.

9. Score the LAP test and return it.

10. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as the instructor directs.

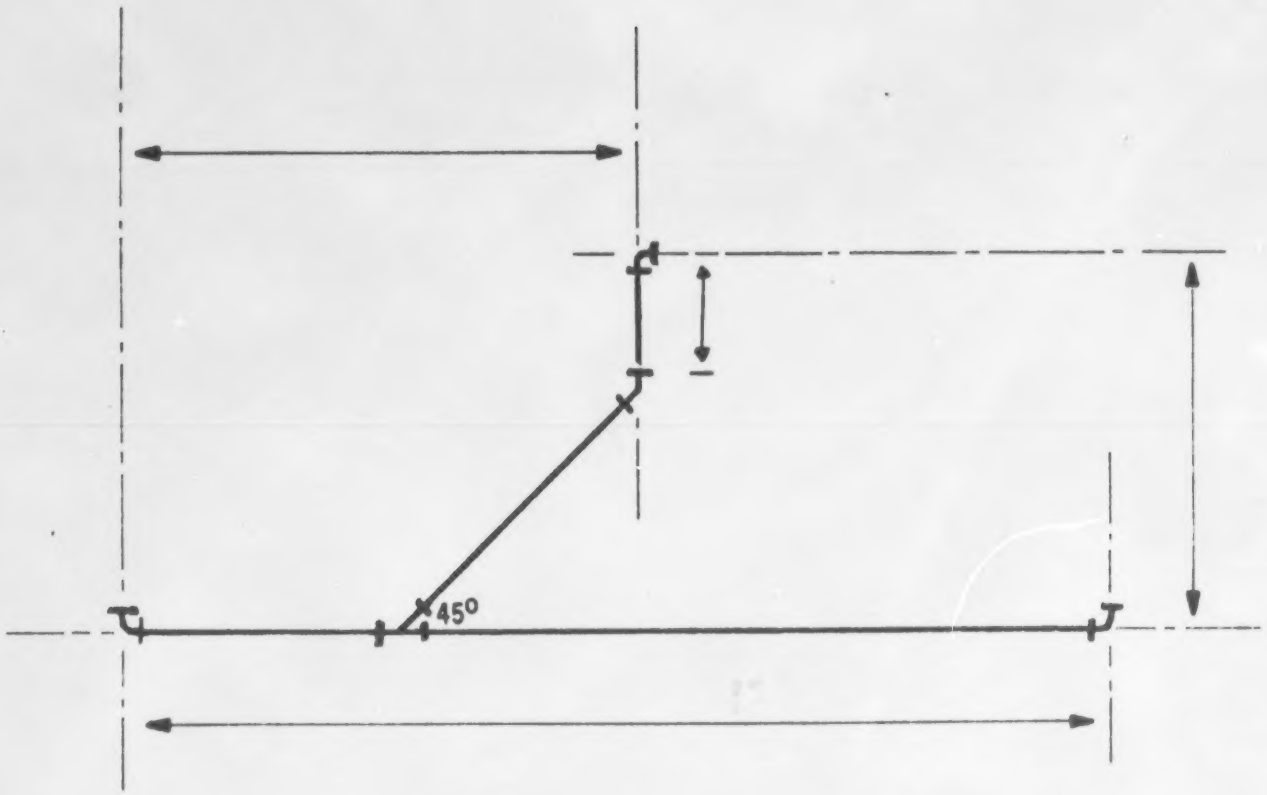
FITTINGS IDENTIFICATION

Directions: Select a fitting from the assortment. After the number below that matches the fitting number write the description and function.

Work Station Number_____ Box Number_____

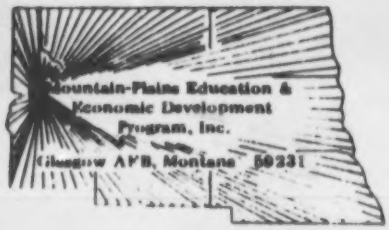
FITTING NUMBER	DESCRIPTION (Size, Weight, Type, Etc.)	FUNCTION (For What Used)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

THREADED WYE ASSEMBLY



Student: _____ File Code: 73.01.01.14.A2-2
73.01.01.15.A2-2

Date: _____ Date Published: 10-25-74



LAP TEST: DRAINAGE TEE AND WYE NOMENCLATURE, FUNCTION AND ASSEMBLY

73.01.01.14

1. Drainage tees range in sizes from:

   a. 1 1/2" to 12".
   b. 1" to 9".
   c. 1 1/4" to 8".
   d. 1 1/8" to 7 1/2".

2. Which of the following types of drainage tees is used on vertical pipes?

   a. Short turn.
   b. Straight.
   c. 30 degree.
   d. 45 degree.

3. Which of the following drainage tee patterns is used on either horizontal or vertical lines when there is enough space?

   a. Short turn.
   b. Straight.
   c. Long turn.
   d. 60 degree.

4. Which type of fitting is generally used in a short space with a closet bend?

   a. Sanitary tee.
   b. Double wye.
   c. Wye and 1/8 bend combination.
   d. Short turn quarter bend.

5. Which drainage tee offers the least resistance to the flow of sewage in a drain line?

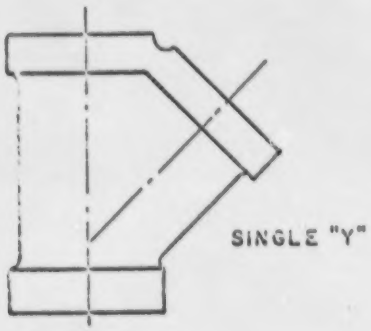
   a. Long turn tee.
   b. Straight tee.
   c. 45 degree tee.
   d. 30 degree tee.

6. At what angle must branches always enter drains?

   a. 60 degrees.
   b. 30 degrees.
   c. 45 degrees.
   d. 90 degrees.

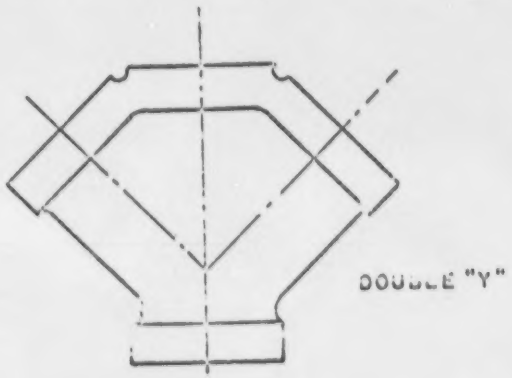
7. What is the angle of the fitting illustrated below?

   a. 45 degrees.
   b. 30 degrees.
   c. 60 degrees.
   d. 90 degrees.



8. What is the angle between the branches of the double Y in the illustration provided below?

   a. 180 degrees.
   b. 90 degrees.
   c. 45 degrees.
   d. 60 degrees.



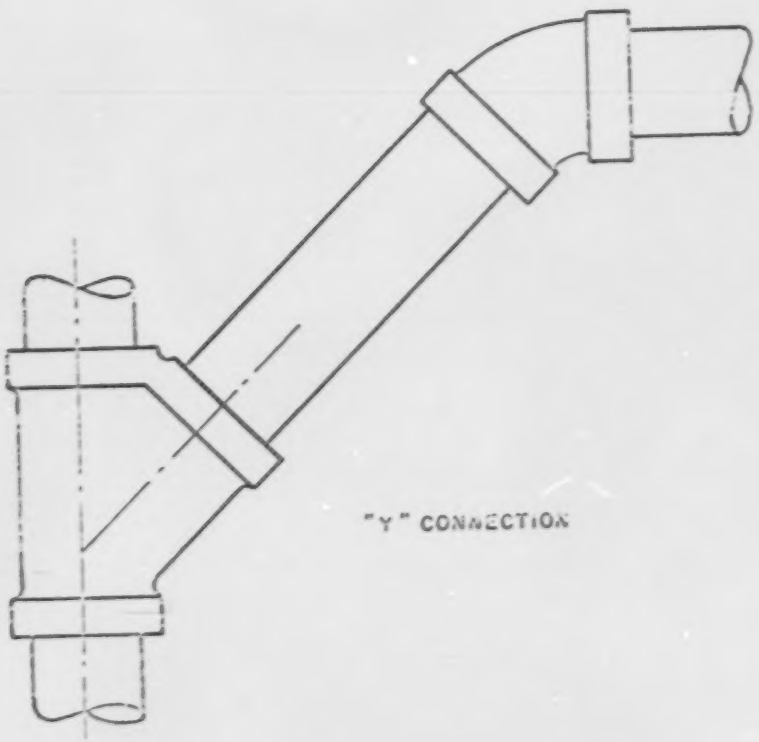
9. It is recommended that at each 90 degree change of direction of drainage lines a cleanout should be placed. Which type of fitting should be used?

   a. A long turn T Y.
   b. A 1/4 bend.
   c. A 1/8 bend.
   d. A wye.

THE FOLLOWING QUESTION REFERS TO THE ILLUSTRATION BELOW:

10. Using a ruler, what is the center to center measurement of the Y and the 45 degree elbow in the illustration?

a. 4 1/8"
b. 4 1/2"
c. 3 5/8"
d. 4 9/16"



"Y" CONNECTION

LAP TEST ANSWER KEY: DRAINAGE TEE AND WYE NOMENCLATURE, FUNCTION AND ASSEMBLY

LAP .14

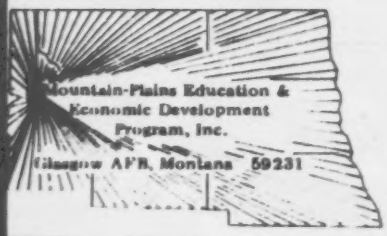
1. C
2. A
3. C
4. A
5. A

LAP .15

6. C
7. A
8. B
9. A
10. C

Student: _____ File Code: 73.01.01.00.A1-5

Date: _____ Date Published: 6/30/75



Family Pay Number; _____ Sex: M F (Circle 1)

UNIT PERFORMANCE TEST: PIPE AND FITTINGS ASSEMBLY

OBJECTIVE 1:

Given specifications and cross section drawing, the student will draw a piping schematic and install a section of hub soil pipe.
The schematic and installation will conform with the State Plumbing Code.

OBJECTIVE 2:

Given specifications and cross section drawing, the student will draw a piping schematic and install a section of no-hub soil pipe.
The schematic and installation will conform with the State Plumbing Code.

OBJECTIVE 3:

Given specifications and cross section drawing, the student will draw a piping schematic and install a section of plastic pipe.
The schematic and installation will conform with the State Plumbing Code.

TASK:

Having a piping schematic, the student will assemble the described piping (hub soil pipe, no-hub soil pipe and plastic pipe) at a training station or on an actual building.

ASSIGNMENT:

CONDITIONS:

The student will be supplied with the necessary tools and equipment to complete the job. He may use any reference materials available. No assistance will be obtained from other students or the instructor.

RESOURCES:

1. Reference Materials:

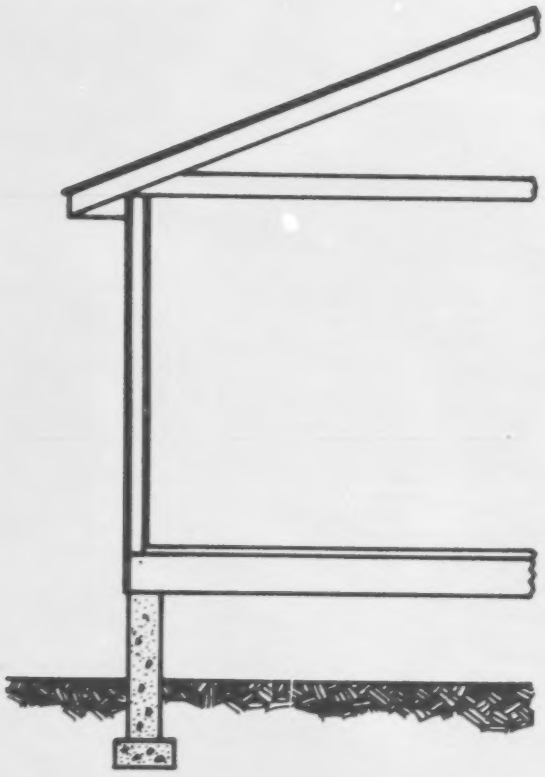
Montana State Plumbing Code
Related information: Plumbing I and II, Harry Slater
Audels Plumbers and Pipe Fitters library materials

2. Equipment:

Typical hand tools (hammer, screwdriver, pliers, etc.)
Pipe cutter
Soil pipe cutter
Lead pot
Lead furnance
Ladle
Caulking irons
Tape, measuring
Plastic pipe cutter
No-hub soil pipe
Hub soil pipe
Plastic pipe
Assorted pipe fittings

ASSIGNMENT SHEET

Run hub soil pipe from a point 5-feet outside the building, under the footing to ground level. From ground level, run no hub to a closet bend. Install plastic PVC for the vent.



Student: _____ File Code: 73.01.01.00.A1-5

Date: _____ Date Published: 11/12/74

Family Pay Number: _____ Sex: M F (Circle 1)

PERFORMANCE CHECKLIST:

OVERALL PERFORMANCE: Satisfactory_____ Unsatisfactory_____

	CRITERION Met	Not Met
Objective 1:		
1. Measure pipe accurately.		
Criterion: To ± 1/8"		
2. Correctly install oakum.		
Criterion: Packed snugly and allows room for approximately		
1" of lead.		
3. Cut pipe correctly using soil pipe cutter.		
Criterion: Manufacturer's directions.		
4. Lead is properly installed.		
Criterion: a. Audel's Plumbers and Pipe Fitter's Library,		
Volume II, Pages 75-81.		
b. Manufacturer's directions for lead pot.		
5. Pipe is properly positioned and fastened.		
Criterion: a. State Plumbing Code for fastening		
b. Position meets the schematic to ± ½"		

(Checklist continued)

	CRITERION Met	Not Met
6. Uses safe practices and procedures.		
Criterion: OSHA		
Objective 2:		
7. Joints are properly installed.		
Criterion: Manufacturer's specifications.		
Objective 3:		
8. Cuts plastic pipe correctly.		
Criterion: a. Manufacturer's directions for plastic		
pipe cutter.		
b. If any other tool is used, the cut must be		
square to ± 1/16".		
9. Joints are properly glued.		
Criterion: Manufacturer's specifications.		
10. Job is completed in a reasonable length of time.		
Criterion: 9 hours.		
Student must complete 8 out of 10 of the line items to pass.		

Student: _____ File Code: 73.01.01.00.B2-2

Date: _____ Date Published: 10-23-74

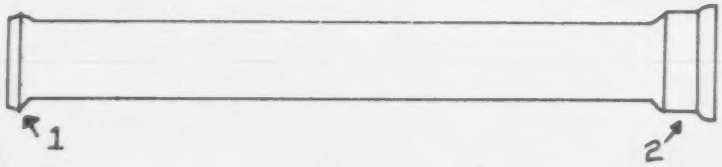
Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

UNIT POST TEST: PIPE AND FITTINGS ASSEMBLY

73.01.01.01

1. Which of the following correctly identifies item #2?

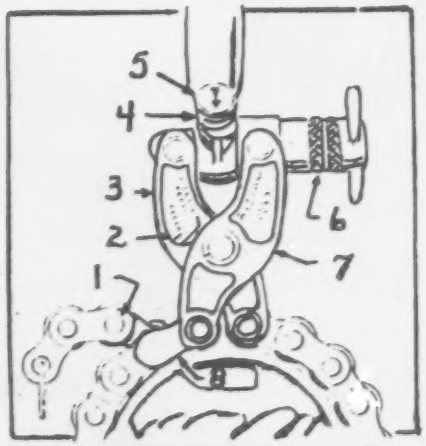
   a. Cover.
   b. Cap.
   c. Hub.
   d. Insert cap.



2. How many inside diameter sizes are available for hub soil pipe?

   a. 4.
   b. 9.
   c. 1.
   d. 6.

THE FOLLOWING ILLUSTRATION IS PROVIDED FOR THE NEXT 3 QUESTIONS:



3. Identify item #3.

   a. inner side arm.
   b. outer side arm.
   c. hook.
   d. ratchet knob.

4. Which of the following identifies item #4?

   a. Ratchet knob.
   b. Ratchet pin.
   c. Adjusting knob.
   d. Chain pin.

5. Identify item #7.

   a. adjusting knob.
   b. inner side arm.
   c. marks.
   d. outer side arm.

73.01.01.02

6. What are the two methods used to join hub type soil pipes and fittings?

   a. caulked lead and hub gasket.
   b. hub gasket and cementing.
   c. welding and caulked lead.
   d. hub gasket and welding.

7. Why should a plumber making a lead caulked joint be particularly aware of moisture around the edge of fittings?

   a. The moisture will cause the molten lead to splatter.
   b. The moisture will cause the fittings to expand.
   c. The moisture will cause the fittings to contract.
   d. The moisture prohibits a good bond.

8. Why is oakum used around pipe fittings?

   a. To provide support for the fittings.
   b. To simply take up space, thereby saving on the amount of lead used.
   c. To provide a cushion for the fittings; absorbs underground shocks.
   d. To help waterproof the joint.

9. What is oakum?

   a. A flexible lead bead.
   b. Old hemp rope soaked in oil.
   c. Oil soaked rags.
   d. Insulation.

10. What is the purpose of using a joint runner when making a lead joint in the horizontal position?

    a. To provide extra support for the joint.
    b. To provide insulation for the joint against the heat of the molten lead.
    c. To retain the molten lead around the joint.
    d. To decrease the amount of time needed to cool the molten lead.

73.01.01.03

11. To identify the right and left hand side of a soil pipe bend, look into the:

    a. Spigot end with the hub end down or toward you.
    b. Hub end with the spigot end down or toward you.
    c. Hub end with the spigot end up or away from you.
    d. Spigot end with the hub end up or away from you.

12. Which of the following items is used to attach the water closet to the closet bend?

    a. Bend with cleanout.
    b. Another closet bend.
    c. Closet flange.
    d. Return bend.

13. For proper sewage flow in a drainage system, it is necessary to connect the branches to all horizontal pipes or runs at an angle no greater than:

    a. 60 degrees.
    b. 15 degrees.
    c. 30 degrees.
    d. 45 degrees.

14. A combination wye and 1/8 bend can be substituted for:

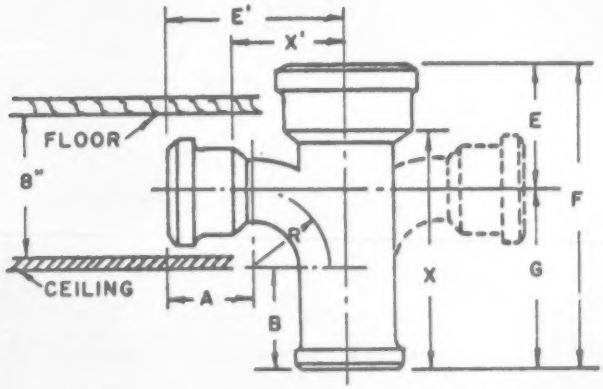
    a. a ¼ bend and a double inverted wye branch.
    b. a 1/8 bend and a wye branch.
    c. a 1/8 bend and a single inverted wye branch.
    d. a 1/4 bend and a wye branch.

15. In degrees, a fifth bend is 1/5 of 360 degrees or:

    a. 72 degrees.
    b. 60 degrees.
    c. 90 degrees.
    d. 45 degrees.

73.01.01.04

THE FOLLOWING ILLUSTRATION AND CHART ARE TO BE USED FOR THE NEXT 2 QUESTIONS:



SINGLE & DOUBLE SANITARY "T" BRANCHES

SIZE	A	B	E	E^1	F	G	R	X	X^1	Weight Single	Weight Double
2	$2\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$5\frac{1}{4}$	$10\frac{1}{2}$	$6\frac{1}{4}$	$2\frac{1}{2}$	8	$2\frac{3}{4}$	8	11
3	$3\frac{1}{4}$	4	$5\frac{1}{4}$	$6\frac{3}{4}$	$12\frac{3}{4}$	$7\frac{1}{2}$	$3\frac{1}{2}$	10	4	16	21
4	$3\frac{1}{2}$	4	6	$7\frac{1}{2}$	14	8	4	11	$4\frac{1}{2}$	22	29
5	$3\frac{1}{2}$	4	$6\frac{1}{2}$	8	15	$8\frac{1}{2}$	$4\frac{1}{2}$	12	5	28	36
3 × 2	3	4	$4\frac{3}{4}$	$6\frac{1}{2}$	$11\frac{3}{4}$	7	3	9	4	14	18
4 × 2	3	4	5	7	12	7	3	9	$4\frac{1}{2}$	17	21
4 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{1}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	$4\frac{1}{2}$	20	25
5 × 2	3	4	5	$7\frac{1}{2}$	12	7	3	9	5	20	24
5 × 3	$3\frac{1}{4}$	4	$5\frac{1}{2}$	$7\frac{3}{4}$	13	$7\frac{1}{2}$	$3\frac{1}{2}$	10	5	23	28

73.01.01.04

16. If the branch of a 4" sanitary tee is centered 4" below the underside of the floor, what is the distance to the bottom of the bead below the ceiling?

    a. 3 1/2" below the ceiling.
    b. 4" below the ceiling.
    c. 3 3/4" below the ceiling.
    d. 3 5/8" below the ceiling.

17. What is the angle of the branch from the run of a sanitary tee?

    a. 180 degrees.
    b. 72 degrees.
    c. 45 degrees.
    d. 90 degrees.

THE FOLLOWING QUESTIONS REFER TO THE ILLUSTRATION AND CHARTS PROVIDED ON THE FOLLOWING PAGES:

18. What is the laying length of a 2" x 8" 45 degree offset.

    a. 13 $\frac{1}{4}$".
    b. 13 3/4".
    c. 15 3/4".
    d. 11 1/4".

19. What is the overall length of a 4" x 6" 60 degree offset?

    a. Cannot be determined from charts provided.
    b. 16".
    c. 18".
    d. 24".

20. What is the distance in inches from the end of the spigot of a 3" x 4" 45 degree offset to the beginning of the first angle?

    a. 4".
    b. 4 1/4".
    c. 3 1/4".
    d. 5".

THE FOLLOWING ILLUSTRATION AND CHARTS ARE FOR QUESTIONS 18, 19, and 20.

2-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
2 × 2	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$9\frac{3}{4}$	2	2	2	$7\frac{1}{4}$	5
2 × 4	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$11\frac{3}{4}$	4	4	2	$9\frac{1}{4}$	6
2 × 6	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$13\frac{3}{4}$	6	6	2	$11\frac{1}{4}$	8
2 × 8	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{4}$	$15\frac{3}{4}$	8	8	2	$13\frac{1}{4}$	9

3-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
3 × 2	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$11\frac{1}{4}$	2	2	$2\frac{1}{2}$	$8\frac{1}{2}$	10
3 × 4	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$13\frac{1}{4}$	4	4	$2\frac{1}{2}$	$10\frac{1}{2}$	12
3 × 6	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$15\frac{1}{4}$	6	6	$2\frac{1}{2}$	$12\frac{1}{2}$	14
3 × 8	$3\frac{1}{4}$	4	$4\frac{1}{4}$	5	$17\frac{1}{4}$	8	8	$2\frac{1}{2}$	$14\frac{1}{2}$	16

4-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X^1	WGT
4 × 2	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	12	2	2	3	9	14
4 × 4	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	14	4	4	3	11	16
4 × 6	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	16	6	6	3	13	19
4 × 8	$3\frac{1}{2}$	4	$4\frac{3}{4}$	$5\frac{1}{4}$	18	8	8	3	15	21

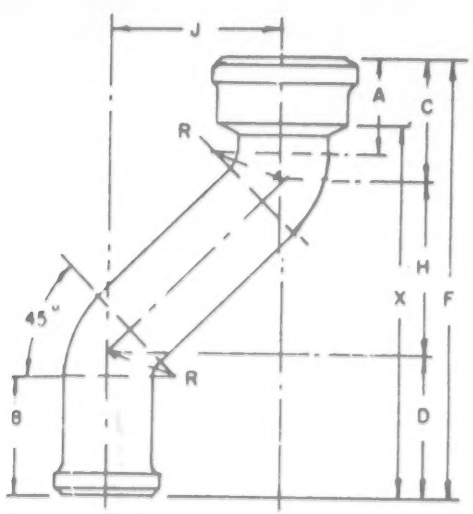
THE FOLLOWING ILLUSTRATION AND CHARTS ARE FOR QUESTIONS 18, 19, and 20.

5-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X[1]	WGT
5 × 2	3 1/2	4 1/8	4 15/16	5 9/16	12 1/2	2	2	3 1/2	9 1/2	17
5 × 4	3 1/2	4 1/8	4 15/16	5 9/16	14 1/2	4	4	3 1/2	11 1/2	21
5 × 6	3 1/2	4 1/8	4 15/16	5 9/16	16 1/2	6	6	3 1/2	13 1/2	24
5 × 8	3 1/2	4 1/8	4 15/16	5 9/16	18 1/2	8	8	3 1/2	15 1/2	27

6-INCH 1/8 BEND OFFSETS

SIZE	A	B	C	D	F	H	J	R	X[1]	WGT
6 × 2	3 1/2	4 1/8	5	5 5/8	13	2 3/8	2	4	10	21
6 × 4	3 1/2	4 1/8	5 3/16	5 13/16	15	4	4	4	12	25
6 × 6	3 1/2	4 1/8	5 3/16	5 13/16	17	6	6	4	14	28
6 × 8	3 1/2	4 1/8	5 3/16	5 13/16	19	8	8	4	16	32



73.01.01.05

21. Which of the following soil pipe fittings is used to join a threaded pipe to a soil pipe hub?

    a. Caulking sleeve.
    b. Vent cowl.
    c. Backwater valve.
    d. Pipe increaser.

22. Which of the following soil pipe fittings is used to simplify hub type soil pipe repair work and alterations?

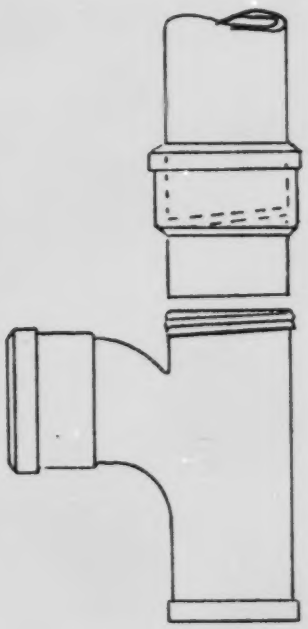
    a. Backwater valve.
    b. Vent cowl.
    c. Pipe increaser.
    d. Insertable joint.

23. A vent cowl is used for which of the following purposes?

    a. Decrease the size of large drains when the capacity of the system changes.
    b. Enlarge the vent opening in cold climates to prevent it from frosting closed.
    c. Prevent down drafts and protect the vent or stack from having objects and/or dirt from falling into it.
    d. Join a threaded pipe to a soil pipe hub.

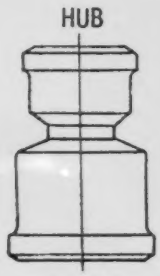
24. Which of the following special soil pipe fittings is illustrated below?

    a. Sisson insertable joint.
    b. Kaffer tee.
    c. Backwater valve.
    d. Caulking sleeve.



25. Which of the following special soil pipe fittings is illustrated below?

    a. Kaffer tee.
    b. Pipe increaser.
    c. Caulking sleeve.
    d. Pipe reducer.



73.01.01.06

26. To support a good number of parallel pipes, a plumber would probably use a:

    a. F. and M. hanger.
    b. Coil hanger.
    c. Perforated strap iron.
    d. Clevis hanger.

27. What type of pipe support should a plumber use to fasten two 1/2" water pipes to a side wall?

    a. Split ring hanger, screwed.
    b. Clevis hanger, bolted.
    c. Perforated strap iron, bolted.
    d. Pipe straps, screwed.

28. What type of pipe support should a plumber use to support a line of 1" galvanized water pipe in a basement?

    a. Coil hanger.
    b. Pipe strap.
    c. F. and M. hanger.
    d. Reznor hooks.

29. Which of the following securing devices should be used to fasten a clevis hanger to a wood joist?

a. Lag bolt.
b. Lag screw.
c. 8d finish nail.
d. Molly screw.

30. What tool should be used to cut a hole in a brick wall?

a. Sabre saw.
b. Coping saw.
c. Keyhole saw.
d. Star drill.

73.01.01.07

31. Which of the following statements is true about plastic pipe?

a. Light weight.
b. Ability to withstand temperature over 150 degrees Fahrenheit.
c. Ability to withstand pressures over 100 to 200 lbs.
d. Inexpensive.

32. Which of the following statements is not true about plastic pipe?

a. May be bent under light weight.
b. Resists corrosion and electrolysis.
c. Good for long runs underground.
d. May be bent under heat.

33. Would it be possible to lift 100,000 pounds of steel with a 1" x 1" plastic bar?

a. Possibly.
b. Yes.
c. Definitely not.
d. Occasionally.

34. On a job where plastic pipe is used for the house service pipe, would the same pipe be used for the basement main? Why?

a. No, plastic pipe tends to sag; must be supported at 3 foot intervals.
b. Yes, this would allow all service pipes and mains to have a common adaptability to one another.
c. No, plastic pipe cannot withstand the pressure required for the basement main.
d. No, plastic pipe cannot withstand the temperature variation required for the basement main.

35. Which of the following tools should a plumber use to cut plastic pipe?

a. Knife.
b. Hacksaw.
c. Portable coping saw.
d. Sabre saw.

73.01.01.08

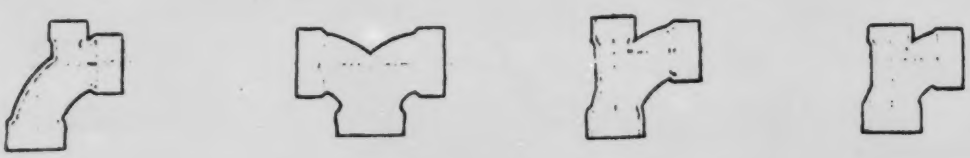
36. Plastic angle fittings are used to:

a. increase the size of the pipe being used.
b. reduce the size of the pipe being used.
c. change the direction of a single pipe.
d. filter debris fron a single pipe.

37. Fitting composition of a plastic angle fitting should match the pipe for a given installation unless:

a. the fitting is to be welded to the pipe.
b. special adhesives are used.
c. a loose fitting installation is called for.
d. the specifications are in error.

THE FOLLOWING 2 QUESTIONS REFER TO THE ILLUSTRATION PROVIDED BELOW:



#1 #2 #3 #4

38. Which of the figures provided above identify an extra long turn 90 degree Ell with a high heel inlet?

a. #1.
b. #2.
c. #3.
d. #4.

39. Which of the figures provided above identifies an extra long turn 90 degree Ell with a low heel inlet?

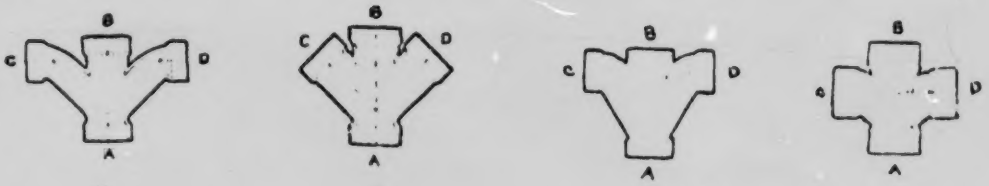
a. #2.
b. #3.
c. #4.
d. #1.

THE FOLLOWING QUESTION REFERS TO THE ILLUSTRATION PROVIDED BELOW:

40. A 45 degree Long Turn Ell is illustrated by figure #:

a. 4.
b. 2.
c. 1.
d. 3.

73.01.01.09 #1 #2 #3 #4



1 2 3 4

41. Which of the figures shown above depicts a sanitary cross ?

a. #2.
b. #4.
c. #1.
d. #3.

42. Identify figure #2.

a. double wye.
b. double long turn TY.
c. sanitary cross with side inlet.
d. double short turn TY.

43. Identify figure #3.

a. double short turn TY.
b. Sanitary cross with side inlet.
c. double wye.
d. double long turn TY.

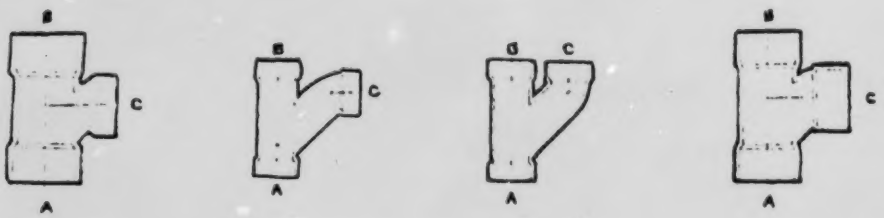
THE FOLLOWING 2 QUESTIONS REFER TO THE FIGURES SHOWN ON THE NEXT PAGE:

44. Identify figure #1.

a. short turn TY reducing (sanitary tee).
b. long turn TY reducing wye (1/8 bend).
c. upturn wye.
d. short turn TY (sanitary tee).

45. Which of the figures shown above correctly identifies an upturn wye?

a. #2.
b. #3.
c. #1.
d. #4.



73.01.01.10

46. The plastic pipe fitting which is used to change one style of pipe or fitting to the use of another is called:

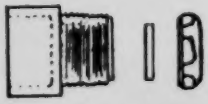
a. a closet flange.
b. a coupling.
c. a bushing.
d. an adapter.

47. Which of the following plastic pipe fittings is used to adapt a pipe to the outlet of a water closet?

a. adapter.
b. bushing.
c. coupling.
d. closet flange.

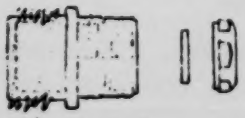
48. Identify the plastic fitting illustration below:

a. male trap adapter.
b. female trap adapter.
c. closet flange.
d. spigot adapter.



49. Identify the plastic fitting illustrated below:

a. cleanout plug.
b. male trap adapter.
c. reducer coupling.
d. fitting cleanout adapter.



50. Which of the following listed plastic pipe fittings identifies the illustration below?

a. Reducer bushing.
b. Adapter coupling.
c. Test/dust cap.
d. Closet flange.

73.01.01.11

51. In how many weights is long pipe available?

a. 2.
b. 3.
c. 5.
d. 8.

52. What is the shape and angle of a pipe thread?

a. V-shaped; 72 degrees.
b. Y-shaped; 45 degrees.
c. V-shaped; 60 degrees.
d. Y-shaped; 60 degrees.

53. The taper of a pipe thread is:

a. 1/8 per inch.
b. 1/16 per inch.
c. 1/64 per inch.
d. 1/32 per inch.

54. What feature of a threaded pipe insures a water tight joint?

a. The taper of the thread.
b. The angle of the thread.
c. The size of the fittings.
d. The use of an "O" ring.

55. What is the proper lip angle for steel pipe?

a. 25-30 degrees.
b. 10-12 degrees.
c. 15-20 degrees.
d. 45-62 degrees.

73.01.01.12

56. When making a center-to-center measurement, how many allowances must be made?

a. Two fitting allowances.
b. Four fitting allowances.
c. One fitting allowance.
d. Three fitting allowance.

REFER TO THE CHARTS ON THE NEXT PAGE FOR THE QUESTIONS 57, and 58:

57. The thread engagement for a 1 1/2" fitting is:

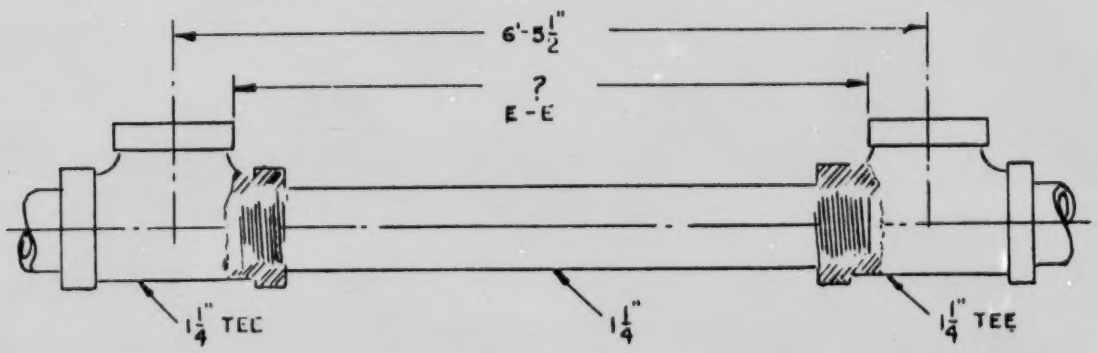
a. 13/16".
b. 9/16".
c. 5/8".
d. 11/16".

58. What is the fitting allowance for a 4" malleable elbow?

a. 2 5/8".
b. 3 3/4".
c. 5 11/16".
d. 8 7/8".

59. Two 1 1/4" malleable tees are to be placed 6'-5½", center-to-center as in the sketch below. What is the length of pipe between them?

a. 5'-11 13/16".
b. 6'-3 5/8".
c. 6'-3 3/8".
d. 5'-11 11/16".



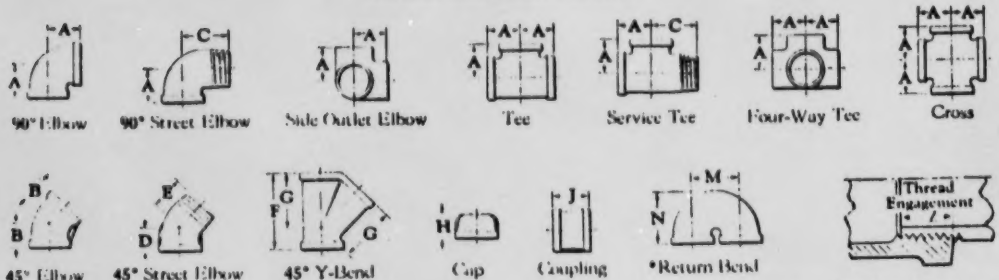
60. A pipe thread tapers:

a. 1/32 per inch of length.
b. 1/16 per inch of length.
c. 1/64 per inch of length.
d. 1/8 per inch of length.

CHARTS FOR QUESTIONS NUMBERS 57 and 58:

150-Pound Malleable Iron Fittings

Dimensions of Straight Sizes, in Inches
Banded and Plain Pattern



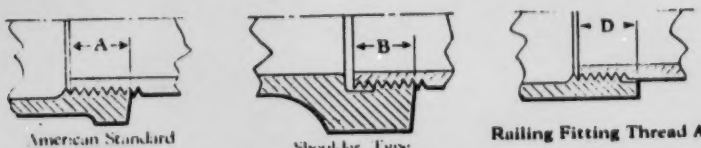
These dimensions apply to both Banded and Plain Fittings; their center to end dimensions are alike.

*Close Pattern Return Bends can not be used to make up parallel coils. The center to center dimension is so close that the bands of adjacent bends will not clear each other.

Size	A	B	C	D	E	F	G	H	J	Return Bends Close M	Close N	Medium M	Medium N	Open M	Open N	Z
⅛	11/16	½	1	11/16	13/16			9/16	15/16							¼
¼	13/16	¾	13/16	⅝	15/16			⅝	1 1/16							⅜
⅜	15/16	13/16	1 7/16	11/16	1 1/16	2⅛	1 7/16	¾	1 5/16							⅜
½	1⅛	⅞	1⅝	13/16	1 5/16	2 7/16	1 11/16	⅞	1 9/16	1	1¾	1¼	1⅝	1½	1⅞	½
¾	1 5/16	1	1⅞	1 5/16	1 9/16	2⅞	2	1 1/16	1½	1¼	2 3/16	1½	1 15/16	2	2¼	9/16
1	1½	1⅛	2⅛	1 1/16	1½	3⅜	2 7/16	1 5/16	1 11/16	1½	2½	1⅞	2¼	2½	2⅝	11/16
1¼	1¾	1 5/16	2 7/16	1¼	1 11/13	4 1/16	2 15/16	1¼	1 15/16	1¾	2 13/16	2¼	2 13/16	3	3 3/16	11/16
1½	1 15/16	1 7/16	2 11/16	1⅜	1⅞	4½	3 5/16	1 5/16	2⅛	2 3/16	3 1/16	2 1/2	3 3/16	3½	3⅝	11/16
2	2¼	1 11/16	3¼	1 11/16	2¼	5 7/16	4	1 7/16	2½	2⅝	3⅞	3	3⅞	4	4⅜	¾
2½	2 11/16	1 15/16	3 13/16			6¼	4 11/16	1 13/16	2⅞					4½	4 13/16	15/16
3	3⅛	2 3/16	4½			7¼	5 9/16	1 15/16	3 3/16					5	5 9/16	1
3½	3 7/16	2⅜						1 15/16								1 1/16
4	3¾	2⅝	5 11/16			8⅞	6 13/16	2 1/16	3 11/16					6	6 11/16	1⅛
5	4½	3 1/16						2⅝								1¼
6	5⅛	3 7/16						2⅞								15/16

2

Normal Engagement
Between Male and Female Threads



American Standard and API Line Pipe Threads

Shoulder Type Drainage Fitting Threads

Railing Fitting Thread Assembly

Size of Pipe	D Length of Pipe Entering Recessed Railing Fitting
½	½
¾	½
1	5/8
1¼	11/16
1½	¾
2	¾

Dimensions, in Inches

Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14
A	1/4	3/8	3/8	1/2	9/16	11/16	11/16	11/16	3/4	15/16	1	1 1/16	1 1/16	1 1/4	1 5/16	1 7/16	1 5/8	1 3/4	
B						9/16	5/8	5/8	5/8	7/8	15/16	1	1 1/16	1 3/16	1 1/4	1 3/8	1 9/16	1 11/16	1 7/8

73.01.01.13

61. What does the word "angle" mean?

a. The point where two lines intersect.
b. The distance between two lines which are not connected to one another
c. The distance between two parallel lines.
d. The amount of space between two lines which are connected at one end.

62. Angles are measured by using a:

a. Plumb bob.
b. Straight rule.
c. Protractor.
d. Divider.

63. When making an offset on a pipe line, a 45 degree elbow is used at the first bend. What fitting should be used for the second bend to return the pipe to its original axis?

a. 45 degree elbow.
b. 30 degree elbow.
c. 60 degree elbow.
d. 90 degree elbow.

64. In how many different angles are drainage pipe elbows available?

a. 9.
b. 7.
c. 5.
d. 6.

65. All 90 degree drainage fittings are tapped to incline the branch pipe:

a. 1/2" per foot.
b. 1/8" per foot.
c. 1/4" per foot.
d. 1/16" per foot.

73.01.01.14

66. Drainage tees range in size from:

a. 1 1/2" to 12".
b. 1" to 9".
c. 1 1/4" to 8".
d. 1 1/8" to 7 1/2".

67. Reducing drainage tees range from:

a. 1 1/2" x 1 1/4" to 8" x 6".
b. 1" x 1 1/2" to 7" x 5".
c. 1 1/4" x 1 1/8" to 7 1/2" x 9".
d. 2" x 1 3/4" to 8" x 5 1/2".

68. What are the three patterns of drainage tees?

a. 30 degree turn, 45 degree turn, and 90 degree turn.
b. 45 degree turn, 90 degree turn, and straight.
c. 30 degree turn, 60 degree turn, and 90 degree turn.
d. Straight, short turn, and long turn.

69. Which of the following drainage tee patterns is permitted only on vent lines?

a. 60 degrees.
b. Short turn.
c. Straight.
d. 30 degrees.

70. What is the distance from the face of the branch to the center of the run on a 4" x 3" drainage wye branch?

a. 8 5/8".
b. 9".
c. 8 13/16".
d. 8 11/16".

73.01.01.15

71. Which of the following is <u>not</u> a characteristic of drainage Y's?

a. Available in single patterns.
b. Available in reducing size.
c. Available in increasing sizes.
d. Available in double patterns.

72. If two branches were to go in opposite directions at the same floor level, what fitting should be used?

a. A single Tee.
b. A single Y.
c. A triple Y.
d. A double Y.

73. What is the length of the run of a 6" x 5" drainage Y-branch?

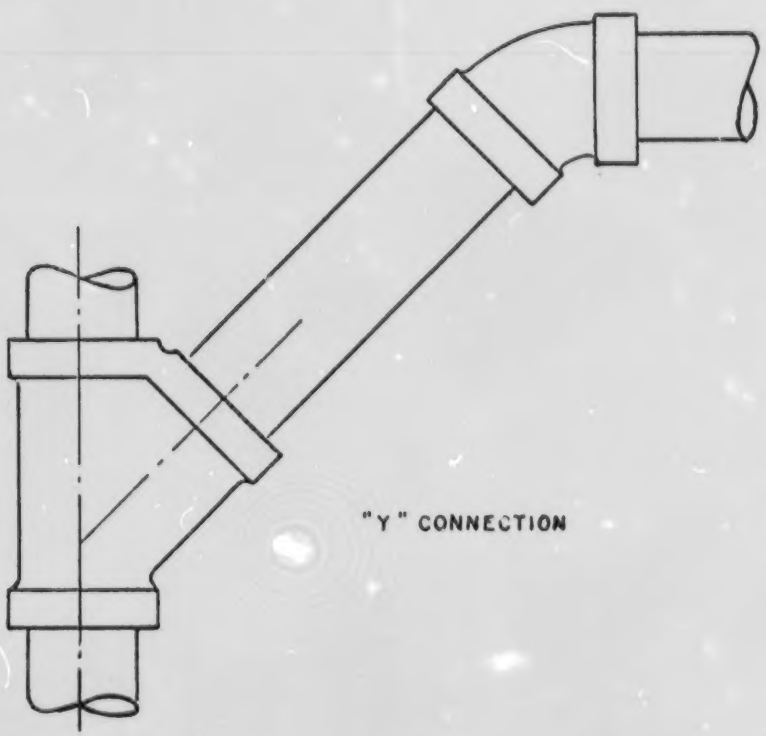
a. 13 1/2".
b. 13 1/4".
c. 12 3/4".
d. 13 3/4".

74. What is the distance from the center to the face of the branch of a 6" x 4" drainage Y? (see illustration and chart on following page).

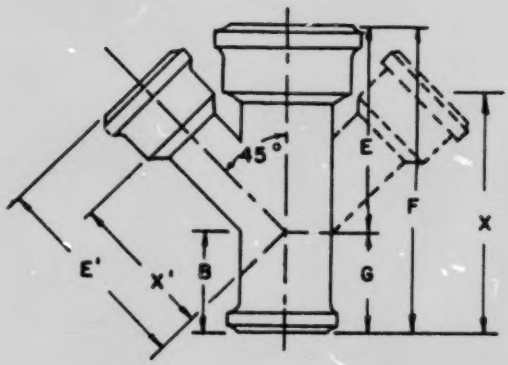
a. 11 5/8".
b. 11 1/4".
c. 12".
d. 12 1/8".

75. What is the angle between the vertical pipe and the branch in the illustration below?

a. 60 degrees.
b. 180 degrees.
c. 45 degrees.
d. 90 degrees.



"Y" CONNECTION



SINGLE AND DOUBLE Y-BRANCHES

SIZE	B (Min)	E	E^1	F	G	X	X^1	Weight Single	Weight Double
2	$3\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	$10\frac{1}{2}$	4	8	4	8	11
3	4	$8\frac{1}{4}$	$8\frac{1}{4}$	$13\frac{1}{4}$	5	$10\frac{1}{2}$	$5\frac{1}{2}$	17	23
4	4	$9\frac{3}{4}$	$9\frac{3}{4}$	15	$5\frac{1}{4}$	12	$6\frac{3}{4}$	24	32
5	4	11	11	$16\frac{1}{2}$	$5\frac{1}{2}$	$13\frac{1}{2}$	8	32	41
3 × 2	4	$7\frac{9}{16}$	$7\frac{1}{2}$	$11\frac{3}{4}$	$4\frac{3}{16}$	9	5	14	18
4 × 2	4	$8\frac{3}{8}$	$8\frac{1}{4}$	12	$3\frac{5}{8}$	9	$5\frac{3}{4}$	17	21
4 × 3	4	$9\frac{1}{16}$	9	$13\frac{1}{2}$	$4\frac{7}{16}$	$10\frac{1}{2}$	$6\frac{1}{4}$	20	26
5 × 2	4	$8\frac{7}{8}$	9	12	$3\frac{1}{1}$	9	$6\frac{1}{2}$	20	24
5 × 3	4	$9\frac{5}{8}$	$9\frac{3}{4}$	$13\frac{1}{2}$	$\frac{7}{8}$	$10\frac{1}{2}$	7	24	30
5 × 4	4	$10\frac{5}{16}$	$10\frac{1}{2}$	15	$4\frac{11}{16}$	12	$7\frac{1}{2}$	27	35
6 × 2	4	$9\frac{7}{16}$	$9\frac{3}{4}$	12	$2\frac{9}{16}$	9	$7\frac{1}{4}$	23	27
6 × 3	4	$10\frac{1}{8}$	$10\frac{1}{2}$	$13\frac{1}{2}$	$3\frac{3}{8}$	$10\frac{1}{2}$	$7\frac{3}{4}$	27	33
6 × 4	4	$10\frac{13}{16}$	$11\frac{1}{4}$	15	$4\frac{3}{16}$	12	$8\frac{1}{4}$	31	39
6 × 5	4	$11\frac{9}{16}$	$11\frac{3}{4}$	$16\frac{1}{2}$	$4\frac{15}{16}$	$13\frac{1}{2}$	$8\frac{3}{4}$	35	45

All dimensions given in inches.
Weights given in pounds.

Dimensions X and X^1 are laying lengths.

UNIT TEST ANSWER SHEET

Post Test

Occupational Area: _____

File Code: 73.01.01.00.B2-2

Name: _____

ANSWERS

1.01.01	1. C		73.01.01.05	21. A		73.01.01.09	41. B
	2. B			22. D			42. A
	3. A			23. C			43. A
	4. B			24. B			44. A
	5. D			25. D			45. B
1.01.02	6. A		73.01.01.06	26. B		73.01.01.10	46. D
	7. A			27. D			47. D
	8. D			28. D			48. B
	9. B			29. B			49. B
	10. C			30. D			50. C
01.01.03	11. B		73.01.01.07	31. A		73.01.01.11	51. B
	12. C			32. D			52. C
	13. D			33. C			53. D
	14. B			34. A			54. A
	15. A			35. B			55. C
01.01.04	16. C		73.01.01.08	36. C		73.01.01.12	56. A
	17. D			37. B			57. D
	18. A			38. A			58. A
	19. A			39. B			59. C
	20. A			40. B			60. A

UNIT TEST ANSWER SHEET

Post Test

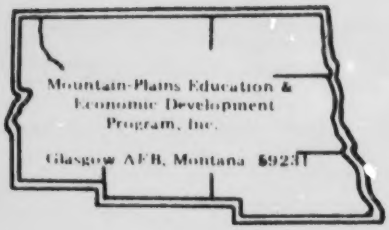
Occupational Area: _____
File Code: 73.01.01.00.B2-2
Name: _____

ANSWERS

01.01.13	61. D _____	81. _____	101. _____
	62. C _____	82. _____	102. _____
	63. A _____	83. _____	103. _____
	64. B _____	84. _____	104. _____
	65. C _____	85. _____	105. _____
01.01.14	66. C _____	86. _____	106. _____
	67. A _____	87. _____	107. _____
	68. D _____	88. _____	108. _____
	69. C _____	89. _____	109. _____
	70. D _____	90. _____	110. _____
01.01.15	71. C _____	91. _____	111. _____
	72. D _____	92. _____	112. _____
	73. A _____	93. _____	113. _____
	74. B _____	94. _____	114. _____
	75. D _____	95. _____	115. _____
	76. _____	96. _____	116. _____
	77. _____	97. _____	117. _____
	78. _____	98. _____	118. _____
	79. _____	99. _____	119. _____
	80. _____	100. _____	120. _____

File Code: 73.01.02.00.A2-1

Date Published 7/10/75



Learning Experience Guide

UNIT: PLANNING, LAYOUT AND ASSEMBLY

RATIONALE:

A plumber is expected to plan, layout and install waste and vent systems that meet given specifications. Since these specifications are provided in plumbing codes, prints and job sheets, it is necessary to develop skills in reading and interpreting them. Knowledge about materials, tools, preparation and installation methods are needed to be an effective plumber. Also needed are skills in laying out and assembling the waste and vent systems. This unit will assist you in developing these knowledges and skills.

PREREQUISITES:

Unit: Pipe and Fittings Assembly

OBJECTIVES:

Recognize the layout and procedures for installing sewer systems, soil stacks, drains, vents, traps, and cleanouts; and identify the types and functions of components used.

Plan layout and assemble vent stack, and house drain according to sketch and specifications following safe practices and procedures.

Determine the discharge capacity in gallons per minute of given stacks, fittings and installations.

Identify and explain procedures for locating and removing drain stoppages.

RESOURCES:

Printed Materials

Montana State Plumbing Code.

Plumbers and Pipe Fitters Library: Materials, Tools, Calculations, Volume 1. Julius Oravetz, Sr., Theodore Audel and Company, 1967.

Related Information Plumbing 1. Harry Slater, Delmar Publishers, 1958.

Related Information Plumbing 2. Harry Slater, Delmar Publishers, 1959.

Principal Author(s): T. Bundy

RESOURCES: cont.

Equipment

Cutter, pipe, plastic.
Cutter, pipe, soil.
Furnace, lead, melting.
Irons, caulking.
Irons, yarning.
Ladle, lead handling.
Plugs, test (assortment).
Pot, lead.
Threader/Reamer/Cutter, pipe, power combination.
Tools, basic (plumber): bit, drill (set) (1/16 to 1 ¼ inch)
box, tool
chalk line
cutter, tubing (1/8 to 5/8 inch)
cutter, tubing (imp)
flaring tool
hacksaw
hammer, claw (16 oz.)
plier, channel lock
rule, steel (12 ft.)
screwdriver (4 in one)
square, combination (12 inch)
wrench, Allen (set)
wrench, open-end, adjustable (6 and 8 inch)
wrench, open-end/box, combination (3/8 to 3/4 inch)
wrench, pipe (12 inch)
Wrench, torque.

GENERAL INSTRUCTIONS:

This unit consists of thirteen Learning Activity Packages (LAPs). Each LAP will provide specific information for completion of a learning activity.

The general procedure for this unit is as follows:

(1) Read the first assigned Learning Activity Package (LAP).
(2) Begin and complete the first assigned LAP.
(3) Take and score the LAP test.
(4) Turn in the LAP test answer sheet.
(5) Determine the reason for any missed items on the LAP test.
(6) Proceed to and complete the next assigned LAP in the unit.
(7) Complete all required LAPs for the unit by following steps 3 through 6.

GENERAL INSTRUCTIONS: CONT

(8) In this Unit, there are some LAPs that have tests combined with other LAP tests. These combined tests are taken after completing the last LAP covered by the test.
(9) Take the unit tests as described in the Unit LEG "Evaluation Procedures".
(10) Proceed to the next assigned unit.

PERFORMANCE ACTIVITIES:

.01 Sewer Construction
.02 Procedures for Grading Pipe
.03 Determining the Amount of Discharge a Drainage System will Accommodate
.04 Soil Stack Layout and Assembly
.05 Waste and Vent Stacks
.06 Trap Nomenclature and Function
.07 Continuous and Wet Vent
.08 Loop or Circuit Vent
.09 Storm Drain Nomenclature and Function
.10 The House Drain
.11 Location of Cleanouts
.12 Floor and Area Drains
.13 Clearing Stoppage in Drains

EVALUATION PROCEDURE:

When pretesting:

1. The student takes the unit multiple-choice pretest.
2. Successful completion is 4 out of 5 items for each LAP part of the pretest.
3. The student then takes a unit performance test if the unit pretest was successfully completed.
4. Satisfactory completion of the performance test is meeting the criteria listed on the performance test.

When post testing:

1. The student takes a multiple-choice unit post test and a unit performance test.
2. Successful unit completion is meeting the listed criteria for the performance test.

FOLLOW-THROUGH

Go to the first assigned Learning Activity Package (LAP) listed on your Student Progress Record (SPR).

Student: _____ File Code: 73.01.02.00,A2-2

Date: _____ Date Published: 7/10/73

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

UNIT PRETEST: PLANNING, LAYOUT AND ASSEMBLY

73.01.02.01

1. What is another name for "terra cotta"?

   a. Black pipe.
   b. Brownish red.
   c. Fired clay.
   d. Vitrified clay.

2. What is the objection to the use of terra cotta pipe for sewers?

   a. Too light.
   b. Joints break; roots enter and clog pipe.
   c. Too expensive.
   d. Difficult to cement properly.

3. What is the correct grade of a house sewer?

   a. 3/4" per ft.
   b. 1/2" per ft.
   c. 1/4" per ft.
   d. 1/8" per ft.

4. Because terra cotta pipe joints may easily leak and may cause undermining of foundations, it is not permitted within:

   a. 10 feet of foundation walls.
   b. 5 feet of foundation walls.
   c. 2 feet of foundation walls.
   d. 15 feet of foundation walls.

5. What is the size of the terra cotta house sewer in relation to the house drain if it is vitrified clay?

   a. Two sizes smaller.
   b. One size smaller.
   c. Two sizes larger.
   d. One size larger.

73.01.02.02

6. What is the result if water runs too slowly in a drain pipe?

   a. The pipe would clog.
   b. Nothing.
   c. The joints would begin to break down.
   d. Pressure would increase.

7. How much total grade should a 2" sink waste pipe 6' long have to obtain the proper velocity of flow?

   a. 3 5/8" total grade.
   b. 4" total grade.
   c. 3 1/8" total grade.
   d. 5" total grade.

8. On a waste pipe which required a grade of 5/8" per foot, what size block should be placed under the end of a 24" level?

   a. 2" block.
   b. 1" block.
   c. 1 1/2" block.
   d. 1 1/4" block.

9. How much grade per foot should a 1 1/2" waste pipe 5' long have, to give to proper velocity of flow?

   a. 5/8" per foot.
   b. 1/2" per foot.
   c. 3/4" per foot.
   d. 1/4" per foot.

10. What tool is used to determine the grade of a waste pipe?

   a. Block only.
   b. Level and block above upper end of pipe.
   c. Level only.
   d. Level and block under lower end of pipe.

73.01.02.03

11. What is the size of the trap and waste pipe of a bathtub? (CHART ON FOLLOWING PAGES)

   a. 1 1/4" trap and 1 1/2" drain.
   b. 2" trap and 2" drain.
   c. 3" trap and 3" drain.
   d. 1 1/2" trap and 1 1/2" drain.

CHARTS FOR QUESTIONS NUMBERS 11, 12, 13, 14, 15:

Fixture Units Per Fixture Or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Bathroom group - 1 toilet, 1 lavatory, 1 bathtub	8			4"
Bathtub	2	4	1 1/2"	1 1/2"
Shower over tub	3	6	2"	2"
Bedpan washer		10	3"	3"
Bidet	2	4	1 1/2"	1 1/2"
Comb. sink and tray	3		1 1/2"	1 1/2"
Dental cuspidor		1	1 1/4"	1 1/4"
Dental lavatory	1	2	1 1/4"	1 1/4"
Drinking fountain		1/2	1 1/4"	1 1/4"
Dishwasher	2	4	1 1/2"	
Kitchen sink, 1 1/2" outlet	2	4	1 1/2"	
Kitchen sink, 2" outlet		5	2"	
Lavatory	1	2	1 1/4" or 1 1/2"	
Lavatory, beauty parlor		3	1 1/2"	
Laundry tray, 1 or 2 part	2	4	1 1/2"	
Shower, each head	2	4	2"	
Sink, surgeon's		3	1 1/2"	
Sink, soda fountain, bar		2	1 1/4"	

Table of Pipe Sizes

Diameter of Pipe (inches)	Maximum Number of Fixture Units That May be Connected to-							
	Building Drain of Sewer Fall per Foot				1 Horizontal Branch	Not Over 3 Branch Intervals	Stacks With 3 or more Branch intervals	
	1/16"	1/8"	1/4"	1/2"			In 1 Branch Interval	Total in Stack
1	2	3	4	5	6	7	8	9
1 1/4					1	2	1	2
1 1/2					3	4	2	8
2			21	26	6	10	6	24
2 1/2			24	31	12	20	9	42
3			* 27	*36	* 20	30	11	60
4		180	216	250	160	240	90	500
5		390	480	575	360	540	200	1,100
6		700	840	1,000	620	960	350	1,900
8	1,400	1,600	1,920	2,300	1,400	2,200	600	3,600
10	2,500	2,900	3,500	4,200	2,500	3,800	1,000	5,600
12	3,900	4,600	5,600	6,700	3,900	6,000	1,500	8,400
15	7,000	8,300	10,000	12,000	7,000			

CHART FOR QUESTIONS NUMBER 11, 12, 13, 14, 15:

Fixture Units Per Fixture or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Sink, flushing rim F.V.		10	3"	
Sink, service (trap stand)		3	3"	
Sink, service		3	1 1/2"	
Sink, pot or scullery		4	1 1/2"	
Urinal pedestal		10	3"	
Urinal (wall lip)		5	1 1/2"	
Urinal stall		5	2"	
Wash sink (each set of faucets)		2	1 1/2"	
Water closet	6	12	3"	

12. What is the fixture unit rate for a toilet in a private home?

    a. 6 fixture units.
    b. 5 fixture units.
    c. 7 fixture units.
    d. 8 fixture units.

13. One bathroom group is rated as how many fixture units?

    a. 7 fixture units.
    b. 9 fixture units.
    c. 8 fixture units.
    d. 6 fixture units.

14. How many fixture units may be drained by a 4" drain having a 1/4" fall per foot?

    a. 250 fixture units.
    b. 480 fixture units.
    c. 27 fixture units.
    d. 216 fixture units.

15. What group was responsible for developing the fixture-unit method?

    a. Scripps Institute, LaJolla, California.
    b. Bureau of Standards, Washington, D.C.
    c. Massachusetts Institute of Technology, Cambridge, Massachusetts.
    d. Bureau of Reclamation, Washington, D.C.

73.01.02.04

16. How many gallons per minute will one lavatory discharge?

a. 7.5 gallons.
b. 9 gallons.
c. 8.5 gallons.
d. 4 gallons.

17. A one-fixture unit is based on which fixture?

a. Lavatory.
b. Stool.
c. Shower.
d. Kitchen sink.

18. To prevent rain from entering the house where a stack passes through the roof, which of the following should be installed?

a. Roof flange.
b. Roof cement.
c. Insulation and roofing cement.
d. A stack cowl (cover).

19. Why are sanitary tees used in small houses?

a. Less expensive, but equally efficient to other fittings that could be used.
b. Ability to handle large volumes of water.
c. Longer life span than other comparable fittings.
d. There is only 8" space between the floor and ceiling.

20. What is the advantage of an adjustable roof flange?

a. Lightweight.
b. Very inexpensive.
c. Can be adjusted to any pitch roof.
d. Can adapt to any type of roof.

73.01.02.05

21. A vent stack is connected to the soil or waste stack with a wye fitting placed at least:

a. 6' below the lowest branch.
b. 4' below the lowest branch.
c. 5' below the lowest branch.
d. 3' below the lowest branch.

22. Fittings in the main drain, for branches, should always pitch up to allow the branch at least:

    a. 3/4" per foot pitch.
    b. 1/8" per foot pitch.
    c. 1/2" per foot pitch.
    d. 1/4" per foot pitch.

23. Which of the following kinds of pipe is best for branch waste pipe?

    a. Brass.
    b. Galvanized iron.
    c. Copper tubing.
    d. Lead.

24. What becomes of the rust scale that falls down in a vent stack?

    a. It clings to the sides of the pipes throughout the system.
    b. Remains in the vent stack.
    c. It is "trapped" by the drain traps.
    d. It is carried away in the main drain.

25. Describe the fitting in the lower end of a 5" soil stack to which a 3" vent stack is to be attached:

    a. a 3" x 5" sanitary tee.
    b. a 5" x 3" short turn TY.
    c. a 3" x 5" long turn TY reducing.
    d. a 5" x 3" medium upright wye.

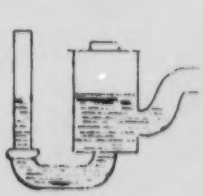
73.01.02.06

26. What is the opposite action to siphonage?

    a. Total vacuum.
    b. Partial vacuum.
    c. Back pressure.
    d. Unequal air pressure.

27. Where would the trap illustrated below be used?

    a. On a sink.
    b. On a toilet.
    c. On a bathtub.
    d. On a urinal.



28. Why is the outlet of a drain trap offset?

a. To provide back pressure.
b. To increase the flow of fluid.
c. To decrease the rate of fluid flow.
d. To protect the cleanout.

29. What is the purpose of the garage sand trap?

a. To prevent only sand from entering regular sewer drains.
b. To prevent sand, gasoline, and oil from entering regular sewer drains.
c. To prevent only gasoline from entering regular sewer drains.
d. To prevent only oil from entering reguiar sewer drains.

30. Soil pipe traps are made in sizes:

a. 3" to 18".
b. 1" to 12".
c. 2" to 15".
d. 4" to 16".

73.01.02.07

31. Why should a branch vent to a single fixture be short?

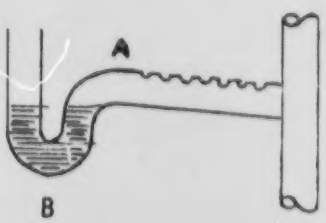
a. So that air will circulate in the branch.
b. To increase the atmospheric pressure in the system.
c. To decrease the atmospheric pressure in the system.
d. To save on the expense of pipe.

32. What size trap is used for a sink?

a. 2" for a dwelling, 4" for hotel and restaurant.
b. 1" for a dwelling, 1 1/2" for hotel and restaurant.
c. 2" for a dwelling, hotel and restaurant.
d. 1 1/2" for a dwelling, 2" for hotel and restaurant.

33. What destructive action is being illustrated by the figure below?

a. Collection of moisture on the top of a pipe.
b. Back pressure.
c. Siphonage.
d. Lack of atmospheric pressure.



34. What could eliminate the problem depicted by the illustration on page 7?

a. The placement of a vent pipe at point "A".
b. The placement of a cleanout plug at point "B".
c. Increase of atmospheric pressure.
d. Decrease of atmospheric pressure.

35. What is the purpose of a wet vent?

a. A waste pipe below a fixture and a vent above the fixture.
b. A vent for a single fixture.
c. A waste pipe below a fixture.
d. A moisture bearing vent.

73.01.02.08

36. On which of the following are loop or circuit vents used?

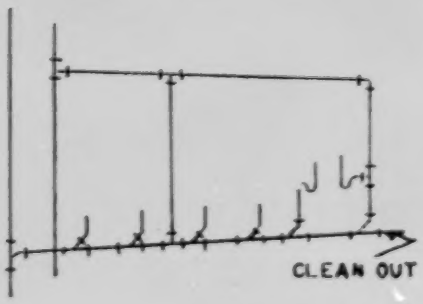
a. Two-story fixtures.
b. A single fixture.
c. A line of fixtures.
d. Multiple story fixtures (more than 2 stories).

37. What is a "loop vent"?

a. The soil and vent stacks are located at opposite ends of a group of fixtures.
b. The soil and vent stacks are both located at the same end of a group of fixtures.
c. The soil stack runs horizontally while the vent stack runs vertically when connected to a group of fixtures.
d. The soil stack runs vertically while the vent stack runs horizontally when connected to a group of fixtures.

38. What type of vent is depicted by the illustration below?

a. Yoke vent.
b. Relief vent.
c. Loop vent.
d. Circuit vent.

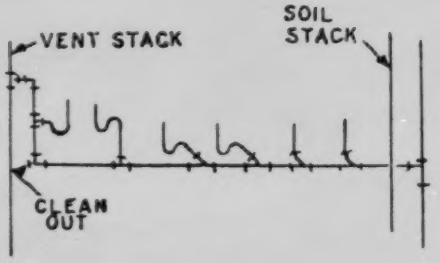


39. What does "C.O." stand for in a diagram of a vent?

a. Carbon oxide.
b. Clear obstruction.
c. Cleanout.
d. Clear loop.

40. What type of vent is illustrated below?

a. Loop vent.
b. Circuit vent.
c. Relief vent.
d. Yoke vent.



73.01.02.09

41. What is the advantage of allowing rain water to discharge into sewers in cities?

a. The flow of this additional source of water can be directed to sewage treatment plants for purification.
b. Drains are thoroughly flushed during heavy storms.
c. Allows contractors to install larger sewage systems.
d. Helps to maintain a constant level of septic tanks.

42. What is the disadvantage of allowing rain water to discharge into septic tanks?

a. Would increase the possibility of siphonage.
b. This increase in pressure would cause the joints to break.
c. Would cause an increase of lead pipe corrosion.
d. Rain water would overload the sewage treating system.

43. Inside rain leaders are subject to the same regulations as:

a. vent stacks.
b. outside rain leaders.
c. drain pipes.
d. grease traps.

44. A wet basement in new construction can be remedied by:

a. laying a system of field tile around the basement.
b. constructing elevator pits.
c. putting broken stone around a basement wall.
d. putting a thin layer of plywood around the basement wall.

45. Which of the following cellar drainers is no longer used?

a. Water or air pressure siphon.
b. Electrically driven centrifugal pump.
c. Float driven pump.
d. Rod and motor driven pump.

73.01.02.10

46. In low sections near rivers, what device is used on house drains to prevent sewage from backing into the buildings from flooded sewers?

a. Traps.
b. Back pressure valves.
c. 180 degree TYs.
d. 90 degree Wyes.

47. Bureau of Health Codes require that all branches shall enter horizontal drains at an angle not greater than:

a. 45 degrees.
b. 30 degrees.
c. 60 degrees.
d. 90 degrees.

48. What type of bend is used on vertical pipes, offsets or changes in direction so that rust scale will not collect?

a. 90 degree bend.
b. 30 degree bend.
c. 60 degree bend.
d. 45 degree bend.

49. When house drains are located near the floor (within 2 feet), they should be supported by:

a. wooden blocks.
b. brick or concrete piers.
c. I beams.
d. H beams.

50. Why is a test tee placed on the house drain just as it enters the basement?

a. To prevent water leaking into the basement.
b. Later used as a cleanout.
c. To provide additional support for angle fittings.
d. To increase the angle of the pipe leaving the basement.

73.01.02.11

51. All codes require cleanouts at the base of:

a. all stacks and inside rain leaders.
b. all vents and all stacks.
c. all inside and outside rain leaders.
d. all vents and outside rain leaders.

52. Where is the best location for a cleanout?

a. At 45 degree bends.
b. Near every second fitting.
c. At 90 degree turns.
d. At each change of direction.

53. Cleanouts shall be the same size as the pipe up to:

a. 4".
b. 3".
c. 5".
d. 6".

54. How should a plumber connect the iron body of a cleanout to the soil pipe?

a. Caulked.
b. Welded.
c. Gasket.
d. Cemented.

55. The iron body trap screw cleanout is available in two types:

a. coped and standard.
b. standard and countersunk.
c. beveled and egg-shaped.
d. egg-shaped and coped.

73.01.02.12

56. Why must floor drains have a water supply handy?

a. To replenish the water in the seal which easily evaporates from heat.
b. To keep the drain thoroughly flushed out.
c. To maintain a consistent pressure throughout the system.
d. To prevent any obstruction from blocking the drain.

THE NEXT THREE QUESTIONS REFER TO THE FORMULA FOR DETERMINING THE SIZE OF AREA DRAINS FOR LARGE SURFACES GIVEN BELOW:

$$D = 12 \frac{AP}{212 \times 60}$$

57. In the formula provided above, what does "D" stand for?

a. The weight of the drain.
b. The diameter of the drain.
c. The drain cover material (iron, steel, etc.)
d. The distance the drain will be from the lowest portion of the floor.

58. What does the letter "A" stand for in the formula provided?

a. The average amount of fluid that the drain will be required to handle.
b. The square feet of area to be drained.
c. The altitude (height) of the building in which the drain will be placed.
d. The square feet of area that makes up the entire building.

59. What does the letter "P" stand for?

a. The atmospheric pressure for drain operation.
b. The type of pipe to be used for the drain.
c. The maximum precipitation in feet per hour rate of rainfall for your state.
d. The maximum pressure the drain system will be able to withstand.

60. How may the seal be maintained on a basement floor drain?

a. Lubricating with multi-purpose grease.
b. By occasionally adding water.
c. Squirting it with automotive oil.
d. replacing it every three months.

73.01.02.13

61. What should be done to the tools after clearing a drain pipe?

a. Thrown away.
b. Cleaned in solvent.
c. Put away.
d. Washed in hot water.

62. What is the first thing a plumber should do when arriving at a job where there is a stoppage?

a. Determine where the stoppage is located.
b. Select the proper tools.
c. Replace the malfunctioning component.
d. Insert a "test" line.

63. If all the fixtures were stopped up and water was running out of the fresh air inlet, where should one look for the stoppage?

a. Test tee.
b. Sink waste pipe.
c. Soil stack.
d. The main house trap.

64. How is a plumber to determine the location of a stoppage?

a. Using a closet auger.
b. Inserting a "test" line.
c. Tapping the pipe with a hammer.
d. Using a coil wire head.

65. What must be done in some cases of stoppage by greases?

a. Use a closet auger.
b. Using a grappler.
c. Use a plunger.
d. Insert a coil wire with cutter.

UNIT TEST ANSWER SHEET
PRETEST

Occupational Area: _____
File Code: 73.01.02.00.A2-2
Name: _____

ANSWERS

73.01.02.01	1.	D		73.01.02.05	21.	D		73.01.02.09	41.	B	
	2.	B			22.	D			42.	D	
	3.	C			23.	C			43.	C	
	4.	B			24.	D			44.	A	
	5.	D			25.	D			45.	A	
73.01.02.02	6.	A		73.01.02.06	26.	C		73.01.02.10	46.	B	
	7.	A			27.	C			47.	A	
	8.	D			28.	D			48.	D	
	9.	A			29.	B			49.	B	
	10.	D			30.	C			50.	B	
73.01.02.03	11.	D		73.01.02.07	31.	A		73.01.02.11	51.	A	
	12.	A			32.	D			52.	D	
	13.	C			33.	A			53.	A	
	14.	D			34.	A			54.	A	
	15.	B			35.	A			55.	B	
73.01.02.04	16.	A		73.01.02.08	36.	C		73.01.02.12	56.	A	
	17.	A			37.	B			57.	B	
	18.	A			38.	B			58.	B	
	19.	D			39.	C			59.	C	
	20.	C			40.	A			60.	B	

UNIT TEST ANSWER SHEET

PRETEST

Occupational Area: _____
File Code: 73.01.02.00.A2-2
Name: _____

ANSWERS

73.01.02.13

61. D
62. A
63. D
64. C
65. D
66. _____
67. _____
68. _____
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115. _____
116. _____
117. _____
118. _____
119. _____
120. _____

File Code: 73.01.02.01.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Sewer Construction

OBJECTIVE:

Recognize public and private sewer layouts.

Express the methods of installing the connection between the structure and the main sewer or septic system.

EVALUATION PROCEDURE:

Correctly answer eight out of ten times on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about the construction and function of sewers, page 111.
   b. Answer the question on page 112, check answers with answer key.
   c. Read about how to make sewer connections, page 113,

      Note: terra cotta is a brownish orange clay pipe.
   d. Answer questions on page 114, check answers with answer key.
   e. Read about the construction of house sewers on pages 115-116.

Principal Author(s): T. Bundy

PROCEDURE: continued

f. Answer questions and make requested sketch on pages 116-117. Check answers with answer key.

2. Take the LAP test. When finished, score the test and return it.

3. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.02.01.A2-2

Date: _____ Date Published: 11-4-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: SEWER CONSTRUCTION

1. What is the usual underground location of a public sewer?

   a. Right side of the street.
   b. Center of the street.
   c. Left side of the street.
   d. Criss-cross the street from left to right.

2. Why are storm sewers made egg-shaped?

   a. To prevent rapid flow of water.
   b. To hold more water.
   c. Self-cleansing, even with small flow.
   d. Prevent pressure build up.

3. Why should the outlet in a sewer pitch up?

   a. To increase the sewage flow.
   b. To prevent the deposit of waste in only one location.
   c. To increase the angularity of the sewer line.
   d. So the house sewer will be above the water level to prevent flooding.

4. What is an outlet placed in a sewer called?

   a. A slope.
   b. A pitch up.
   c. A slant.
   d. A house trap.

5. What size hole should be cut in a sewer for a 5" terra cotta house sewer?

   a. Exactly a 5" hole.
   b. About a 9" hole.
   c. About a 7" hole.
   d. About a 11" hole.

6. Which part of a house sewer is the weakest?

   a. The joints.
   b. The slant.
   c. The pipe.
   d. The house trap.

7. What is another name for "terra cotta"?

   a. Black pipe.
   b. Brownish red.
   c. Fired clay.
   d. Vitrified clay.

8. What is the correct grade of a house sewer?

   a. 3/4" per ft.
   b. 1/2" per ft.
   c. 1/4" per ft.
   d. 1/8" per ft.

9. Because terra cotta pipe joints may easily leak and may cause undermining of foundations, it is not permitted within:

   a. 10 feet of foundation walls.
   b. 5 feet of foundation walls.
   c. 2 feet of foundation walls.
   d. 15 feet of foundation walls.

10. What would happen if the pipe extended into the sewer?

   a. It would form an obstruction.
   b. The main sewer line would burst immediately.
   c. Nothing.
   d. The flow of sewage would increase.

LAP TEST ANSWER KEY: SEWER CONSTRUCTION

1. B
2. C
3. D
4. C
5. C
6. A
7. D
8. C
9. B
10. A

File Code: 73.01.02.02.A2-0

Date Published: 7/9/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Procedures for Grading Pipe

OBJECTIVES:

Identify procedure and purpose for assembling pipe to specified grade.

Identify the procedure for obtaining assembled pipe grade.

EVALUATION PROCEDURE:

Answer correctly eight out of ten items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about the purpose of grading pipes and how it is done on pages 120-121.
   b. Answer questions on page 121-122. Check answers with the answer key.
   c. Read about how to determine the grade of drains on page 142.
   d. Answer questions on page 143. Check answers with the answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

Student: _____ File Code: 73.01.02.02.A2-2

Date: _____ Date Published: 7/9/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: PROCEDURES FOR GRADING PIPE

1. Approximately how much grade does a drain pipe have and in which direction?

   a. 1/8" per foot toward the sewer.
   b. 1/2" per foot away from the sewer.
   c. 1/4" per foot toward the sewer.
   d. 3/4" per foot away from the sewer.

2. How can you determine when a surface is level?

   a. The level will have the air bubble in the right portion of the glass.
   b. The level will have the air bubble in the left portion of the glass.
   c. The level will have the air bubble in the center of the glass.
   d. The air bubble will not be visible in the glass.

3. All the air in a hot water heating system will pass up to the radiators if the pipe:

   a. is level.
   b. is graded up.
   c. is graded down.
   d. is set at any position.

4. The ideal rate of drainage flow is:

   a. 260 feet per minute.
   b. 200 feet per minute.
   c. 450 feet per minute.
   d. 150 feet per minute.

5. Using a level 3' long, you are grading a drain pipe 1/2" per foot. What size block of wood should be used to obtain the proper grade?

   a. 1-1/2" block.
   b. 1" block.
   c. 1-3/4" block.
   d. 2" block.

6. How fast should water run through a main house drain pipe?

   a. 200 feet per minute.
   b. 260 feet per minute.
   c. 450 feet per minute.
   d. 150 feet per minute.

7. How much total grade should a 2" sink waste pipe 6' long have to obtain the proper velocity of flow?

   a. 3 5/8" total grade.
   b. 4" total grade.
   c. 3 1/8" total grade.
   d. 5" total grade.

8. On a waste pipe which required a grade of 5/8" per foot, what size block should be placed under the end of a 24" level?

   a. 2" block.
   b. 1" block.
   c. 1 1/2" block.
   d. 1 1/4" block.

9. How much grade per foot should a 1 1/2" waste pipe 5' long have, to give to proper velocity of flow?

   a. 5/8" per foot.
   b. 1/2" per foot.
   c. 3/4" per foot.
   d. 1/4" per foot.

10. What is the grade of a steam main?

   a. 2 1/2" per hundred feet.
   b. 2 3/4" per hundred feet.
   c. 2" per hundred feet.
   d. 3" per hundred feet.

LAP TEST ANSWER KEY: PROCEDURES FOR GRADING PIPE

1. C
2. C
3. B
4. A
5. A
6. B
7. A
8. D
9. A
10. A

File Code: 73.01.02.03.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Determining the Amount of Discharge a Drainage System will Accommodate

OBJECTIVES:

Define the fixture unit.

Determine the discharge capacity required for given installations using appropriate fixture unit and pipe capacity tables.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test that is combined with "Soil Stack Layout and Assembly" LAP test and is taken after cmpleting that LAP.

RESOURCES:

Related Information Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments.
   a. Read "Fixture-Unit" and for what it is used on pages 94-95.
   b. Answer questions on page 96. Check answers with the answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

File Code: 73.01.02.04.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Soil Stack Layout and Assembly

OBJECTIVES:

Determine capacity of soil stacks and fittings in gallon per minute.

Determine the layout for a soil stack that meets the standards of the National Plumbing Code and specified capacity using minimum pipe size and number of fittings.

Assemble a soil stack according to specifications using appropriate tools and procedures.

EVALUATION PROCEDURE:

Answer correctly eight out of ten items on a multiple-choice objective test. Assembled soil stack meets given specifications.

RESOURCE:

Related Information Plumbing 2, Slater.

Pipe.
Pipe cutter.
Pipe fittings.
Tape measure.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments:

   a. Read "Roof Flashings" on page 42.

   b. Answer questions and make the sketch requested on page 43. Check answers with answer key.

Principal Author(s): T. Bundy

c. Read about plumbing stack construction and how capacities are determined on pages 97-98.

d. Answer question and make requested sketch on pages 99-100. Check answers with answer key.

2. Using the attached sketch "Bathroom Plan," determine a waste and vent layout that will meet the standards of the Plumbing Codes, using the minimum pipe size, length of pipe and number of fittings.

3. Make a sketch of your plan and have the instructor evaluate it.

4. If satisfactory, install the plumbing stack using plastic pipe and fittings.

   Note; DO NOT GLUE JOINTS!

   If unsatisfactory, proceed as directed by the instructor.

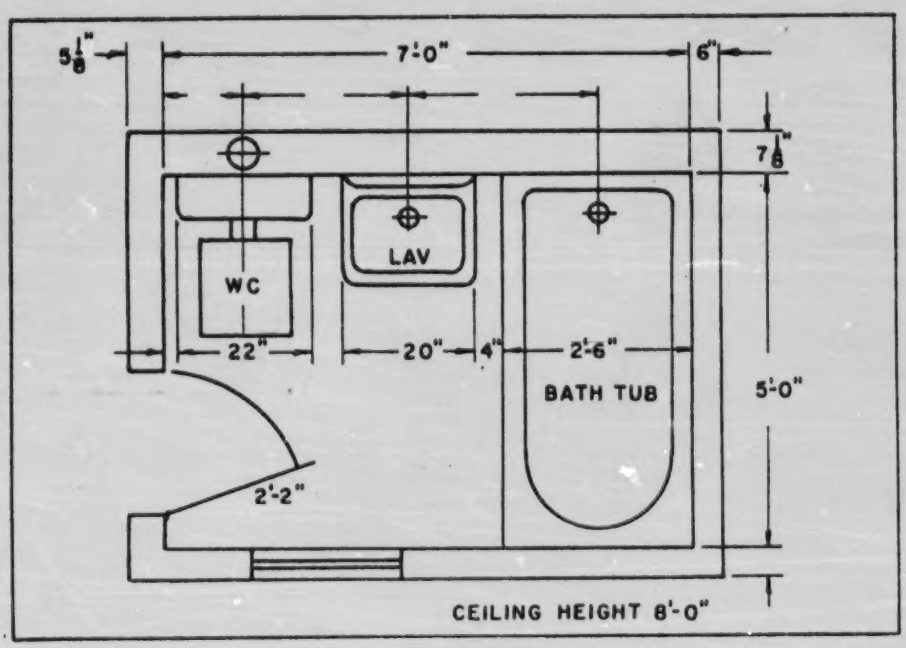
5. Have the instructor evaluate the assembly.

6. If satisfactory, take the LAP test. If unsatisfactory, proceed as directed by the instructor.

7. Score the LAP test and return it.

8. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as directed by the instructor.

BATHROOM PLAN



USE PEE TRAP IN TUB WASTE

Student: _____ File Code: 73.01.02.03.A2-2
73.01.02.04

Date: _____ Date Published: 11-4-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: DETERMINING THE AMOUNT OF DISCHARGE A DRAINAGE SYSTEM WILL ACCOMMODATE /SOIL STACK LAYOUT AND ASSEMBLY

REFER TO THE CHARTS ON THE FOLLOWING PAGES FOR THE NEXT FIVE QUESTIONS:

1. What is the weight of water in a fixture unit?

   a. A fixture unit equals 1/2 cubic foot or 4.6 gallons which weighs 22.9 lbs.
   b. A fixture unit equals 4 cubic feet or 21 gallons which weighs 154.6 lbs.
   c. A fixture unit equals 1 cubic foot or 7 1/2 gallons which weighs 62.5 lbs.
   d. A fixture unit equals 2 cubic feet of 11 gallons which weighs 142.8 lbs.

2. What is the fixture unit rate for a toilet in a private home?

   a. 6 fixture units.
   b. 5 fixture units.
   c. 7 fixture units.
   d. 8 fixture units.

3. One bathroom group is rated as how many fixture units?

   a. 7 fixture units.
   b. 9 fixture units.
   c. 8 fixture units.
   d. 6 fixture units.

4. What is the total fixture units which may be drained by a 4" stack with three branch intervals?

   a. 30 fixture units.
   b. 540 fixture units.
   c. 240 fixture units.
   d. 960 fixture units.

5. What group was responsible for developing the fixture unit method?

   a. Scripps Institute, LaJolla, California.
   b. Bureau of Standards, Washington, D.C.
   c. Massachusetts Institute of Technology, Cambridge, Massachusetts.
   d. Bureau of Reclamation, Washington, D.C.

CHARTS FOR QUESTIONS ONE THROUGH FIVE ON THE PREVIOUS PAGE:

Fixture Units Per Fixture Or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Bathroom group - 1 toilet, 1 lavatory, 1 bathtub	8			4"
Bathtub	2	4	1 1/2"	1 1/2"
Shower over tub	3	6	2"	2"
Bedpan washer		10	3"	3"
Bidet	2	4	1 1/2"	1 1/2"
Comb. sink and tray	3		1 1/2"	1 1/2"
Dental cuspidor		1	1 1/4"	1 1/4"
Dental lavatory	1	2	1 1/4"	1 1/4"
Drinking fountain		1/2	1 1/4"	1 1/4"
Dishwasher	2	4	1 1/2"	
Kitchen sink, 1 1/2" outlet	2	4	1 1/2"	
Kitchen sink, 2" outlet		5	2"	
Lavatory	1	2	1 1/4" or 1 1/2"	
Lavatory, beauty parlor		3	1 1/2"	
Laundry tray, 1 or 2 part	2	4	1 1/2"	
Shower, each head	2	4	2"	
Sink, surgeon's		3	1 1/2"	
Sink, soda fountain, bar		2	1 1/4"	

Table of Pipe Sizes

	Maximum Number of Fixture Units That May be Connected to-							
Diameter of Pipe (inches)	Building Drain of Sewer Fall per Foot				1 Horizontal Branch	Not Over 3 Branch Intervals	Stacks With 3 or more Branch intervals	
	1/16"	1/8"	1/4"	1/2"			In 1 Branch Interval	Total in Stack
1	2	3	4	5	6	7	8	9
1 1/4					1	2	1	2
1 1/2					3	4	2	8
2			21	26	6	10	6	24
2 1/2			24	31	12	20	9	42
3			* 27	*36	* 20	30	11	60
4		180	216	250	160	240	90	500
5		390	480	575	360	540	200	1,100
6		700	840	1,000	620	960	350	1,900
8	1,400	1,600	1,920	2,300	1,400	2,200	660	3,600
10	2,500	2,900	3,500	4,200	2,500	3,800	1,000	5,600
12	3,900	4,600	5,600	6,700	3,900	6,000	1,500	8,400
15	7,000	8,300	10,000	12,000	7,000			

CHART FOR QUESTIONS ONE THROUGH FIVE ON PAGE ONE:

Fixture Units Per Fixture or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Sink, flushing rim F.V.		10	3"	
Sink, service (trap stand)		3	3"	
Sink, service		3	1 1/2"	
Sink, pot or scullery		4	1 1/2"	
Urinal pedestal		10	3"	
Urinal (wall lip)		5	1 1/2"	
Urinal [illegible]		5	2"	
Wash sink (each set of faucets)		2	1 1/2"	
Water closet	6	12	3"	

73.01.02.04

6. Which of the methods described below should be followed to place a roof flange on a shingle roof?

   a. Cement the flange on top of the shingles below the stack.
   b. Slip the flange under the shingles above the stack.
   c. Slip the flange under the shingles below the stack.
   d. Cement the flange on top of the shingles above the stack.

7. What is the formula for determining the capacity of fittings?

   a. $C = ABL$
   b. $C = KD^2$
   c. $C = R^2$
   d. $W = LH$

8. How many gallons per minute will be drained by a 6" sanitary tee?

   a. 405 GPM
   b. 198 GPM
   c. 738 GPM
   d. 278 GPM

9. Why are sanitary tees used in small houses?

   a. Less expensive, but equally efficient to other fittings that could be used.
   b. Ability to handle large volumes of water.
   c. Longer life span than other comparable fittings.
   d. There is only 8" space between the floor and ceiling.

10. What is the advantage of an adjustable roof flange?

    a. Lightweight.
    b. Very inexpensive.
    c. Can be adjusted to any pitch roof.
    d. Can adapt to <u>any</u> type of roof.

LAP TEST ANSWER KEY: DETERMINING THE AMOUNT OF DISCHARGE A DRAINAGE SYSTEM WILL ACCOMMODATE/SOIL STACK LAYOUT AND ASSEMBLY

LAP .03

1. C
2. A
3. C
4. C
5. B

LAP .04

6. B
7. B
8. A
9. D
10. C

File Code: 73.01.02.05.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Waste and Vent Stacks

OBJECTIVE:

Identify the types of waste and vent stacks and describe their purpose.

EVALUATION PROCEDURE:

Successfully answer eight out of ten items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignment:
   a. Read about the different types of waste stacks on pages 101-103.
   b. Answer the questions and make the requested sketch on pages 104-105. Check the answers with the answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP. If unsatisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

Student: _____ File Code: 73.01.02.05.A2-2

Date: _____ Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: WASTE AND VENT STACKS

1. What is meant by the terms "small fixture"?

   a. Any plumbing fixture except sinks.
   b. Any plumbing fixture except bathtubs.
   c. Any plumbing fixture.
   d. Any plumbing fixture except toilets.

2. How would the lack of proper venting affect a metal pipe in a drainage system?

   a. Moisture clinging to the inside of a horizontal pipe absorbs corrosive gases. Proper ventilation would eliminate these gases.
   b. There would be an improper amount of atmospheric pressure in the pipes, thereby affecting the rate of fluid and waste flow.
   c. There would be an imbalance in the atmospheric pressure in the pipes, thereby causing the weakest portions of the systems (joints) to break.
   d. The affects of improper ventilation would be so minimal that very little could be noticed.

3. At what angle should a branch waste pipe enter a main drain?

   a. 30 degrees.
   b. 45 degrees.
   c. 90 degrees.
   d. 60 degrees.

4. A vent stack is connected to the soil or waste stack with a wye fitting placed at least:

   a. 6' below the lowest branch.
   b. 4' below the lowest branch.
   c. 5' below the lowest branch.
   d. 3' below the lowest branch.

5. Fittings in the main drain, for branches, should always pitch up to allow the branch at least:

   a. 3/4" per foot pitch.
   b. 1/8" per foot pitch.
   c. 1/2" per foot pitch.

6. How far above the highest fixture where it is reconnected to the soil or waste stack must a vent stack extend?

   a. At least five (5) feet.
   b. At least four (4) feet.
   c. At least three (3) feet.
   d. At least eight (8) feet.

7. In cold climates small stacks must be increased by how much before passing through the roof to prevent freezing?

   a. At least 6 inches.
   b. At least 5 inches.
   c. At least 4 inches.
   d. At least 7 inches.

8. If a 4" vent stack was jointed to a 4" soil stack, to what size should the soil stack be increased?

   a. 5".
   b. 8".
   c. 7".
   d. 6".

9. Describe the fitting in the lower end of a 5" soil stack to which a 3" vent stack is to be attached:

   a. a 3" x 5" sanitary tee.
   b. a 5" x 3" short turn TY.
   c. a 3" x 5" long turn TY reducing.
   d. a 5" x 3" medium upright wye.

10. How much grade per inch should a 2" branch waste pipe 8' long have?

    a. 1/8" per foot.
    b. 5/8" per foot.
    c. 3/8" per foot.
    d. 11/16" per foot.

LAP TEST ANSWER KEY: WASTE AND VENT STACKS

1. D
2. A
3. B
4. D
5. D
6. C
7. C
8. D
9. D
10. B

File Code: 73.01.02.06.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Trap Nomenclature and Function

OBJECTIVE:

Identify traps by size, name and purpose.

EVALUATION PROCEDURE:

Correctly answer 8 out 10 items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

Related Information Plumbing 2, Slater

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about the kinds and uses of soil traps on pages 84-85.
   b. Answer the questions and make the required sketches on page 86. Check answers with the answer key.
   c. Find out about house traps on pages 123-124.
   d. Answer the question on page 125. Check answers with answer key.

Principal Author(s): T. Bundy

PROCEDURE: CONT.

2. Using Related Information Plumbing 2, do the following assignments:

   a. Read about the sizes and types of drainage traps on page 38.

   b. Answer the questions on pages 38-39. Check answers with the answer key.

   c. Read about the different factors which cause loss of trap seal on pages 106-110.

   d. Answer the questions and make the required sketches on pages 110-113. Check answers with the answer key.

   e. Read about the different types of fixture and grease traps on pages 124-126.

   f. Answer the questions and make the required sketches on pages 126-128. Check the answers with the answer key.

   g. Read about garage sand traps on pages 129-130.

   h. Answer the questions on pages 130-131. Check the answers with answer key.

3. Take the LAP test.

4. Score the LAP test and return it.

5. If satisfactory, begin the next assigned LAP.
   If unsatisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.02.06.A2-2

Date: _____ Date Published: 11-4-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: TRAP NOMENCLATURE AND FUNCTION

1. Which of the following is an advantage of a cast iron trap over a terra cotta trap?

   a. Has to be set 10 feet away from any building.
   b. Weighs less.
   c. Joints do not break.
   d. Simpler to install.

2. Why should the fresh air inlet of a trap inside a basement be kept 10 feet from a window?

   a. Sewage odors may enter the building.
   b. Prevent excessive accumulation of moisture.
   c. Prevent the installation of the house trap from being in error.
   d. Prevent damage to the building's foundation in case of pressure build-up in the sewage system.

3. What is the purpose of the plug in the bottom of a drainage trap?

   a. For cleaning obstructions from the trap.
   b. To release any excessive atmospheric pressure build-up.
   c. For draining off water.
   d. In case the need for any further modifications or additions to the present plumbing is needed; the hook-up could be made at this point.

4. What special feature is found inside a drainage trap at the bottom of the thread?

   a. The inside of all drainage traps is recessed to provide a smooth interior.
   b. A filtering screen.
   c. A notched hub for future additions to the plumbing.
   d. A corrosion inhibitor to prevent the build-up of rust.

5. What is a siphon?

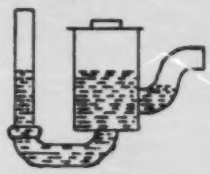
   a. A straight tube with arms of equal length.
   b. A bent tube with arms of unequal length.
   c. A bent tube with arms of equal length.
   d. A straight tube with arms of unequal length.

6. What is the opposite action to siphonage?

   a. Total vacuum.
   b. Partial vacuum.
   c. Back pressure.
   d. Unequal air pressure.

7. Where would the trap illustrated below be used?

   a. On a sink.
   b. On a toilet.
   c. On a bathtub.
   d. On a urinal.



8. Why is the outlet of a drain trap offset?

   a. To provide back pressure.
   b. To increase the flow of fluid.
   c. To decrease the rate of fluid flow.
   d. To protect the cleanout.

9. What may occur if gasoline gets into a public sewer?

   a. An explosion.
   b. Nothing.
   c. The sewer will become clogged.
   d. Excessive corrosion.

10. What is the purpose of the garage sand trap?

   a. To prevent only sand from entering regular sewer drains.
   b. To prevent sand, gasoline and oil from entering regular sewer drains.
   c. To prevent only gasoline from entering regular sewer drains.
   d. To prevent only oil from entering regular sewer drains.

LAP TEST ANSWER KEY: TRAP NOMENCLATURE AND FUNCTION

1. C
2. A
3. A
4. A
5. B
6. C
7. C
8. D
9. A
10. B

File Code: 73.01.02.07.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Continuous and Wet Vent

OBJECTIVES:

Identify the characteristics of acceptable continuous and wet vents.

Describe the layout of continuous and wet vents.

EVALUATION PROCEDURE:

Correctly answer 8 out 10 items on a multiple-choice objective test that is combined with "Loop or Circuit Vent" LAP test and is taken after cmpleting that LAP.

RESOURCES:

Related Information Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments:
   a. Read about continuous and wet vents on pages 114-115.
   b. Answer the questions and make the required sketch on pages 116-117. Check answers with answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP.
   If unsatisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

File Code: 73.01.02.08.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Loop or Circuit Vent

OBJECTIVES:

Identify the characteristics of acceptable loop or circuit vents.

Describe how the loop and circuit vents are installed.

EVALUATION PROCEDURE:

Correctly answer 8 out 10 items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments:
   a. Read about loop and circuit vents on page 118.
   b. Answer the questions on page 119. Check anwers with answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP.
   If unsatisfactory, proceed as directed by the instructor.

Principal Author(s):

T. Bundy

Student: _____ File Code: 73.01.02.07.A2-2
73.01.02.08.A2-2

Date: _____ Date Published: 11-4-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: CONTINUOUS AND WET VENT/LOOP OR CIRCUIT VENT

73.01.02.07

1. Which of the following types of pipe cannot be used for venting?

   a. Steel.
   b. Copper.
   c. Lead.
   d. Galvanized iron.

2. What size trap is used for a sink?

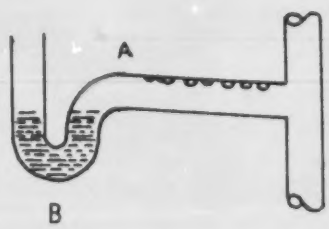
   a. 2" for a dwelling, 4" for hotel and restaurant.
   b. 1" for a dwelling, 1 1/2" for hotel and restaurant.
   c. 2" for a dwelling, hotel and restaurant.
   d. 1 1/2" for a dwelling, 2" for hotel and restaurant.

3. Which of the following pipe fittings is not recommended for use in a vent stack?

   a. Short turn drainage TY.
   b. Long turn drainage TY.
   c. Single drainage TY.
   d. Double drainage TY.

4. What destructive action is being illustrated by the figure below?

   a. Collection of moisture on the top of a pipe.
   b. Back pressure.
   c. Siphonage.
   d. Lack of atmospheric pressure.



5. What is the purpose of a wet vent?

   a. A waste pipe below a fixture and a vent above the fixture.
   b. A vent for a single fixture.
   c. A waste pipe below a fixture.
   d. A moisture bearing vent.

73.01.02.08

6. What is a "loop vent"?

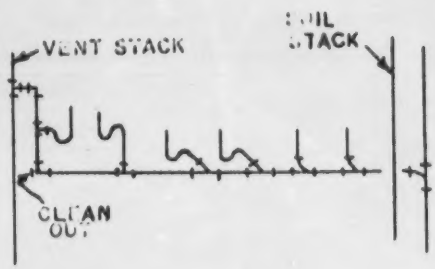
   a. The soil and vent stacks are located at opposite ends of a group of fixtures.
   b. The soil and vent stacks are both located at the same end of a group of fixtures.
   c. The soil stack runs horizontally while the vent stack runs vertically when connected to a group of fixtures.
   d. The soil stack runs vertically while the vent stack runs horizontally when connected to a group of fixtures.

7. What is the purpose of a relief vent?

   a. To relieve air pressure on branch waste near the stack.
   b. To increase the air pressure on branch waste near the stack.
   c. To decrease the rate of fluid flow.
   d. To create a partial vacuum in the branch vent near the stack.

8. What type of vent is illustrated below?

   a. Loop vent.
   b. Yoke vent.
   c. Circuit vent.
   d. Relief vent.



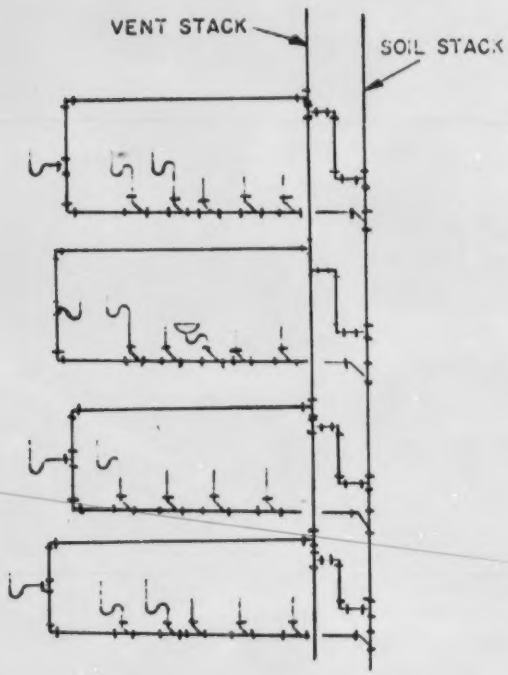
9. What does "C.O." stand for in a diagram of a vent?

   a. Carbon oxide.
   b. Clear obstruction.
   c. Cleanout.
   d. Clear loop.

10. What type of vent is illustrated on the next page?

   a. Yoke vent.
   b. Relief vent.
   c. Loop vent.
   d. Circuit vent.

ILLUSTRATION FOR QUESTION NUMBER TEN ON THE PREVIOUS PAGE:



LAP TEST ANSWER KEY: CONTINUOUS AND WET VENT/LOOP OR CIRCUIT VENT

LAP .07

1. A
2. D
3. B
4. A
5. A

LAP .08

6. B
7. A
8. C
9. C
10. A

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

File Code: 73.01.02.09.A2-0

Date Published: 7/10/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Storm Drain Nomenclature and Function

OBJECTIVES:

Identify the components of a storm drain.

Describe the purpose, how and where to install storm drains and drain components.

EVALUATION PROCEDURE:

Successfully answer 8 out 10 items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 2, do the following assignments:
   a. Read about rain leaders on page 132.
   b. Answer the questions and make the required sketch on pages 133-134. Check answers with answer key.
   c. Read about sumps and cellar drains on pages 135-136.
   d. Answer the question and make the required sketches on pages 136-137.

Principal Author(s): T. Bundy

PROCEDURE CONT:

2. Take the LAP test.

3. Score the LAP test and return it.

4. If satisfactory, begin the next assigned LAP.

   If unsatisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.02.09.A2-2

Date: _____ Date Published: 11-4-74

Mountain-Plains Education & Economic Development Program, Inc.
Malmstrom AFB, Montana 59231

LAP TEST: STORM DRAIN NOMENCLATURE AND FUNCTION

1. The deep seal trap with cleanout for inside rain leaders are generally constructed of:

   a. cast iron.
   b. galvanized steel.
   c. wrought iron.
   d. copper.

2. Outside rain leaders above ground that discharge at the curb are usually constructed of:

   a. DWV pipe and fittings.
   b. cast iron and lead caulked joints.
   c. vitrified clay and cement joints.
   d. copper tubing and welded joints.

3. What is the advantage of allowing rain water to discharge into sewers in cities?

   a. The flow of this additional source of water can be directed to sewage treatment plants for purification.
   b. Drains are thoroughly flushed during heavy storms.
   c. Allows contractors to install larger sewage systems.
   d. Helps to maintain a constant level in septic tanks.

4. What is the disadvantage of allowing rain water to discharge into septic tanks?

   a. Would increase the possibility of siphonage.
   b. This increase in pressure would cause the joints to break.
   c. Would cause an increase of lead pipe corrosion.
   d. Rain water would overload the sewage treating system.

5. Outside rain leaders above ground that discharge at the curb do <u>not</u> require:

   a. Soil pipe.
   b. Traps.
   c. Lead pipe.
   d. Strainer.

6. A wet basement in new construction can be remedied by:

   a. laying a system of field tile around the basement.
   b. constructing elevator pits.
   c. putting broken stone around a basement wall.
   d. putting a thin layer of plywood around the basement wall.

7. If a field tile system is used in a basement, it is connected to a:

   a. float to control the water level.
   b. house drain.
   c. sump in the basement below the floor.
   d. check valve to regulate the water flow.

8. If a field tile system is used in a basement, it should be covered with:

   a. broken stone.
   b. fiberglass.
   c. asbestos.
   d. tar paper and oil.

9. Which of the following cellar drainers is no longer used?

   a. Water or air pressure siphon.
   b. Electrically driven centrifugal pump.
   c. Float driven pump.
   d. Rod and motor driven pump.

10. The type of cellar drainer which is controlled by a float is the:

   a. water pressure siphon pump.
   b. electrically driven centrifugal pump.
   c. air pressure siphon pump.
   d. steam pressure siphon pump.

LAP TEST ANSWER KEY: STORM DRAIN NOMENCLATURE AND FUNCTION

1. A
2. C
3. B
4. D
5. B
6. A
7. C
8. A
9. A
10. B

File Code: 73.01.02.10.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: The House Drain

OBJECTIVES:

Identify the purpose of a house drain.

Determine the location and explain the procedure for installation of a house drain.

Install a house drain using appropriate tools and procedures according to specifications.

EVALUATION PROCEDURE:

Successfully answer 8 out of 10 items on a multiple-choice objective test.

Installed house drain meets given specifications

RESOURCES:

Related Information Plumbing 1, Slater.

Couplings.
No-hub soil pipe.
No-hub soil pipe fittings.
Pipe cutter.
Tape measure.
Torque wrench.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:

   a. Read about the house drain on pages 131-133.

Principal Author(s): T. Bundy

PROCEDURE: CONT.

b. Answer the questions and make the required sketches on pages 133-136. Check answers with the answer key.

c. Read about the flow of sewage in the line on page 137.

d. Answer questions on page 138. Check the answer with the answer key.

2. Have the instructor dimension the attached sketch "House Drain"

3. Assemble the pipe and fittings as shown on the attached sketch. No-hub pipe and fittings are to be used to make the assembly.

4. Have the instructor evaluate the assembly.

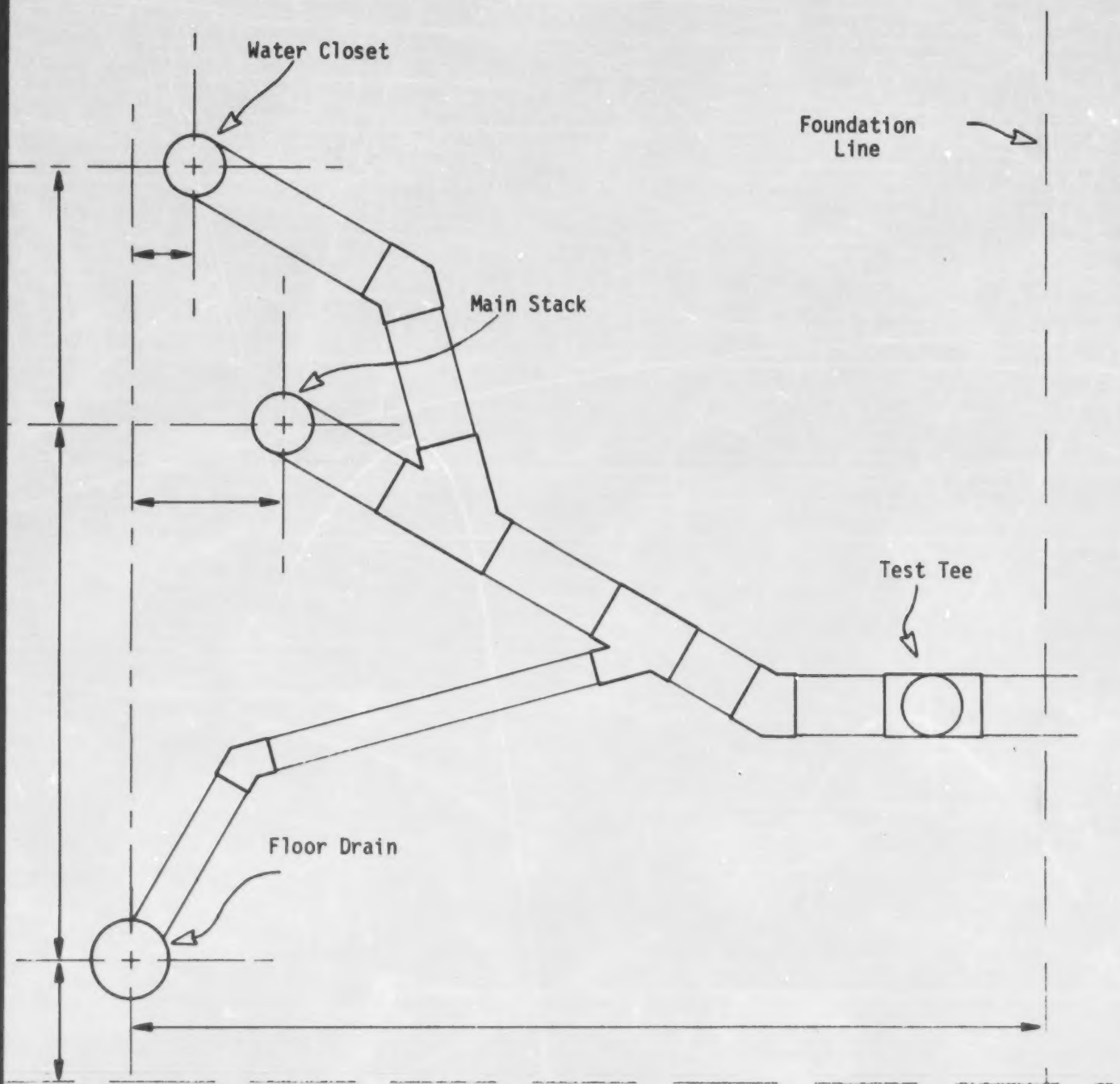
5. If satisfactory, disassemble the pipe and fittings, return the pipe and fittings, clean and return tools, and take the LAP test.

6. Score the LAP test and return it.

7. If satisfactory, begin the next assigned LAP.

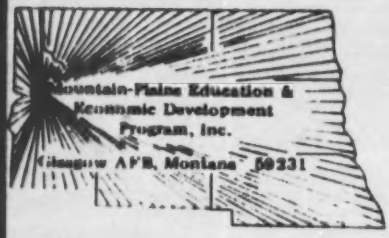
   If unsatisfactory, proceed as directed by the instructor.

House Drain


Water Closet
Foundation Line
Main Stack
Test Tee
Floor Drain

Student: _____ File Code: 73.01.02.10.A2-2

Date: _____ Date Published: 11-4-74



LAP TEST: THE HOUSE DRAIN

1. Which of the following statements best describe the position of the house drain?

   a. The lowest vertical pipe in a building.
   b. The lowest horizontal pipe in a building.
   c. The highest horizontal pipe in a building.
   d. The highest vertical pipe in a building.

2. When the house drain connects with the house sewer, it extends:

   a. to the front of the building.
   b. to the rear of the building.
   c. to the right side of the building.
   d. to the left side of the building.

3. House drains usually have a grade of:

   a. 1/4" per foot toward the sewer.
   b. 1/2" per foot toward the sewer.
   c. 1/8" per foot toward the sewer.
   d. 5/8" per foot toward the sewer.

4. Why is it desirable to have house drains obtain a velocity of 260 feet per minute?

   a. Allows fluid flow to be made with greater ease.
   b. At this rate the drains are self-scouring.
   c. Helps maintain a constant atmospheric pressure in the entire system.
   d. Puts less pressure on the drainage system joints.

5. When the house drain is below the basement floor or in large buildings, it must be constructed of:

   a. galvanized steel pipe and recessed fittings.
   b. medium cast iron soil pipe and fittings.
   c. extra heavy cast iron soil pipe and fittings.
   d. wrought iron pipe and recessed fittings.

6. In low sections near rivers, what device is used on house drains to prevent sewage from backing into the building from flooded sewers?

   a. Traps.
   b. Back pressure valves.
   c. 180 degree TYs.
   d. 90 degree wyes.

7. What type of bend is used on vertical pipes, offsets or changes in direction so that rust scale will not collect?

   a. 90 degree bend.
   b. 30 degree bend.
   c. 60 degree bend.
   d. 45 degree bend.

8. The most important place to position a support on a house drain is:

   a. at the center of each piece of pipe.
   b. at each bell.
   c. directly under the stack.
   d. under each other piece of pipe.

9. When house drains are located near the floor (within 2 feet), they should be supported by:

   a. wooden blocks.
   b. brick or concrete piers.
   c. I beams.
   d. H beams.

10. Why is a test tee placed on the house drain just as it enters the basement?

    a. To prevent water leaking into the basement.
    b. Later used as a cleanout.
    c. To provide additional support for angle fittings.
    d. To increase the angle of the pipe leaving the basement.

LAP TEST ANSWER KEY: THE HOUSE DRAIN

1. B
2. B
3. A
4. B
5. C
6. B
7. D
8. C
9. B
10. B

File Code: 73.01.02.11.A2-0

Date Published: 7/10/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Location of Cleanouts

OBJECTIVES:

Identify sizes of various drain cleanout fittings.

Describe the purpose and determine the location for drain cleanouts.

EVALUATION PROCEDURE:

Answer correctly 8 out of 10 items on a multiple-choice objective test that is combined with "Floor and Area Drains" LAP test and is taken after completing that LAP.

RESOURCES:

Related Information Plumbing 1, Slater.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about various types of cleanouts on pages 139-140.
   b. Answer the questions and make the requested sketches on page 141. Check the answers with the answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If satisfactory, begin the next assigned LAP.

   If not satisfactory, proceed as directed by the instructor

Principal Author(s): T. Bundy

File Code: 73.01.02.12,A2-0

Date Published: 7/11/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Floor and Area Drains

OBJECTIVES:

Describe the purpose of floor drains.

Idnetify the various types of drains and determine where they apply.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

Related INformation Plumbing 2, Slater.

PROCEDURE:

1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about floor and area drains on pages 152-153.
   b. Answer the questions on pages 153-154. Check answers with the answer key.
2. Using Related Information Plumbing 2, do the following assignments:
   a. Read more about drains on pages 40-41.
   b. Answer the questions on page 41. Check answer with answer key.

Principal Author(s): T. Bundy

PROCEDURE: CONT.

3. Take the LAP test.

4. Score the LAP test and return it.

5. If satisfactory, begin the next assigned LAP.

   If unsatisfactory, proceed as directed by the instructor.

Student: _____ File Code: 73.01.02.11.A2-2
73.01.02.12.A2-2

Date: _____ Date Published: 11-5-74

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

LAP TEST: LOCATION OF CLEANOUTS/FLOOR AND AREA DRAINS

73.01.02.11

1. All codes require cleanouts at the base of:

   a. all stacks and inside rain leaders.
   b. all vents and all stacks.
   c. all inside and outside rain leaders.
   d. all vents and outside rain leaders.

2. Which of the following materials is generally used for the construction of cleanouts?

   a. Copper.
   b. Steel.
   c. Iron.
   d. Aluminum.

3. The iron body trap screw cleanout is made in sizes from:

   a. 2" to 8".
   b. 4" to 8".
   c. 3" to 7".
   d. 2" to 10".

4. How should a plumber connect the iron body of a cleanout to the soil pipe?

   a. Caulked.
   b. Welded.
   c. Gasket.
   d. Cemented.

5. The iron body trap screw cleanout is available in two types:

   a. coped and standard.
   b. standard and countersunk.
   c. beveled and egg-shaped.
   d. egg-shaped and coped.

73,01,02,12

6. Floor drains are constructed of:

   a. brass.
   b. galvanized steel.
   c. cast iron.
   d. wrought iron.

7. Why must floor drains have a water supply handy?

   a. To replenish the water in the seal which easily evaporates from heat.
   b. To keep the drain thoroughly flushed out.
   c. To maintain a consistent pressure throughout the system.
   d. To prevent any obstruction from blocking the drain.

THE NEXT QUESTION REFERS TO THE FORMULA FOR DETERMINING THE SIZE OF AREA DRAINS FOR LARGE SURFACES GIVEN BELOW:

$$D = 12 \quad \frac{AP}{212 \times 60}$$

8. What does the letter "A" stand for in the formula provided?

   a. The average amount of fluid that the drain will be required to handle.
   b. The square feet of area to be drained.
   c. The altitude (height) of the building in which the drain will be placed.
   d. The square feet of area that makes up the entire building.

9. What size pipe would drain an area 10' wide x 100' long?

   a. 5".
   b. 3".
   c. 4".
   d. 6".

10. How could evaporation in a drain pipe of a floor drain be prevented?

   a. By placing a water faucet close by.
   b. Keeping it covered.
   c. Keeping it lubricated.
   d. Keeping a constant flow of water through it.

LAP TEST ANSWER KEY: LOCATION OF CLEANOUTS/FLOOR AND AREA DRAINS

LAP .11

1. A
2. C
3. A
4. A
5. B

LAP .12

6. C
7. A
8. B
9. C
10. A

File Code: 73.01.02.13.A2-0

Date Published: 7/11/75

Mountain-Plains Education & Economic Development Program, Inc.
Glasgow AFB, Montana 59231

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Clearing Stoppage in Drains

OBJECTIVE:

Identify and explain procedures for locating and removing a drain stoppage.

EVALUATION PROCEDURE:

Correctly answer 8 out of 10 items on a multiple-choice objective test.

RESOURCES:

Related Information Plumbing 1, Slater.

PROCEDURE:

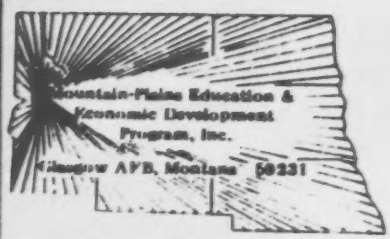
1. Using Related Information Plumbing 1, do the following assignments:
   a. Read about clearing stoppages in drains on page 147.
   b. Answer the questions on page 148. Check answers with answer key.
   c. Read more about clearing stoppages on pages 149-150.
   d. Answer the questions on pages 150-151. Check answers with answer key.
2. Take the LAP test.
3. Score the LAP test and return it.
4. If test results are satisfactory, begin the next assigned LAP.

   If test results are unsatisfactory, proceed as directed by the instructor.

Principal Author(s): T. Bundy

Student: _____ File Code: 73.01.02.13.A2-2

Date: _____ Date Published: 11-5-74



LAP TEST: CLEARING STOPPAGE IN DRAINS

1. Which of the following "clogs" is the worst to remove from fixture traps or waste pipes?

   a. Hair.
   b. Grease.
   c. Lint.
   d. Miscellaneous articles.

2. What fixture is usually stopped by hair?

   a. Toilet.
   b. Lavatory.
   c. Laundry tub.
   d. Utility sink.

3. What fixture is usually stopped by lint?

   a. Laundry tub.
   b. Toilet.
   c. Kitchen sink.
   d. Lavatory.

4. How should a lead pencil be removed from a toilet bowl?

   a. Closet auger.
   b. Coil wire with cutting head.
   c. Power driven coil wire.
   d. Bent wire.

5. What should be done to the tools after clearing a drain pipe?

   a. Thrown away.
   b. Cleaned in solvent.
   c. Put away.
   d. Washed in hot water.

6. What is the first thing a plumber should do when arriving at a job where there is a stoppage?

   a. Determine where the stoppage is located.
   b. Select the proper tools.
   c. Replace the malfunctioning component.
   d. Insert a "test" line.

7. If all the fixtures were stopped up and water was running out of the fresh air inlet, where should one look for the stoppage?

   a. Test tee.
   b. Sink waste pipe.
   c. Soil stack.
   d. The main house trap.

8. Which of the following drain components is most likely to be clogged with grease?

   a. Soil stack.
   b. Main house trap.
   c. Sink waste pipe.
   d. Laundry tub.

9. Which of the following cleaning tools should be used on a toilet?

   a. Closet auger.
   b. Grappler.
   c. Plunger.
   d. Coil head wire.

10. How is a plumber to determine the location of a stoppage?

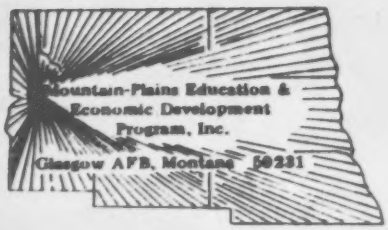
    a. Using a closet auger.
    b. Inserting a "test" line.
    c. Tapping the pipe with a hammer.
    d. Using a coil wire head.

LAP TEST ANSWER KEY: CLEARING STOPPAGE IN DRAINS

1. B
2. B
3. A
4. A
5. D
6. A
7. D
8. C
9. A
10. C

Student: _____ File Code: 73.01.02.00.B2-2

Date: _____ Date Published: 7/10/75



UNIT POST TEST: PLANNING, LAYOUT AND ASSEMBLY

73.01.02.01

1. Where is an outlet placed in order to keep it out of water in the sewer?

   a. Above the center of the sewer---about 90 degree angle.
   b. Even with the center of the sewer---about 90 degree angle.
   c. Below the center of the sewer---about 60 degree angle.
   d. Above the center of the sewer---about 45 degree angle.

2. In what proportion is cement for terra cotta joints mixed?

   a. Three parts sand to one part dry cement. Then add water to make the mortar stiff.
   b. Four parts sand to one and one-half parts dry cement. Then add water to make the motar stiff.
   c. Three parts sand to one-half parts dry cement. Then add water to make the mortar stiff.
   d. Two parts sand to one part dry cement. Then add water to make the mortar stiff.

3. What is the objection to the use of terra cotta pipe for sewers?

   a. Too light.
   b. Joints break; roots enter and clog pipe.
   c. Too expensive.
   d. Difficult to cement properly.

4. What tool is used to determine the pitch of drain pipes?

   a. Plumb bob.
   b. Level.
   c. Straight rule.
   d. Tape measure.

5. What is the size of the terra cotta house sewer in relation to the house drain if it is vitrified clay?

   a. Two sizes smaller.
   b. One size smaller.
   c. Two sizes larger.
   d. One size larger.

73.01.02.02

6. If the level is 18 inches long and the pitch is 1/4" per foot, how thick a block should be placed under the level?

   a. 5/8" block.
   b. 3/4" block.
   c. 1/8" block.
   d. 3/8" block.

7. If a level is placed on top of a pipe, under which end is the block placed?

   a. Under the lower end.
   b. Above the lower end.
   c. Under the upper end.
   d. Above the upper end.

8. What is the result if water runs too slowly in a drain pipe?

   a. The pipe would clog.
   b. Nothing.
   c. The joints would begin to break down.
   d. Pressure would increase.

9. What is the grade per foot of a 4" drain pipe 40 feet long, to obtain the proper velocity of flow?

   a. 11/16" grade per foot.
   b. 5/16" grade per foot.
   c. 5/8" grade per foot.
   d. 1/2" grade per foot.

10. What tool is used to determine the grade of a waste pipe?

    a. Block only.
    b. Level and block above upper end of pipe.
    c. Level only.
    d. Level and block under lower end of pipe.

73.01.02.03

REFER TO THE CHARTS ON THE NEXT PAGES FOR QUESTIONS 11, 12, 13, 14, 15:

11. Upon what is the fixture-unit based?

    a. The discharge of a bathtub=2 cubic feet per minute.
    b. The discharge of a bathroom group=8 cubic feet per minute.
    c. The discharge of a lavatory=1 cubic foot per minute.
    d. The discharge of a sink=3 cubic feet per minute.

12. What is the weight of water in a fixture unit?

    a. A fixture unit equals 1/2 cubic foot or 4.6 gallons which weighs 22.9 lbs.
    b. A fixture unit equals 4 cubic feet or 21 gallons which weighs 154.6 lbs.
    c. A fixture unit equals 1 cubic foot or 7 1/2 gallons which weighs 62.5 lbs.
    d. A fixture unit equals 2 cubic feet of 11 gallons which weighs 142.8 lbs.

13. What is the size of the trap of a fixture rated as one fixture unit?

    a. 3".
    b. 2".
    c. 1 1/4".
    d. 1 1/2".

14. What is the size of the trap and waste pipe of a bathtub?

    a. 1 1/4" trap and 1 1/2" drain.
    b. 2" trap and 2" drain.
    c. 3" trap and 3" drain.
    d. 1 1/2" trap and 1 1/2" drain.

15. How many fixture units may be drained by a 4" drain having a 1/4" fall per foot?

    a. 250 fixture units.
    b. 480 fixture units.
    c. 27 fixture units.
    d. 216 fixture units.

73.01.02.04

16. What are the three types of piping on which roof flange can be used?

    a. Cast iron, terra cotta, and DWV.
    b. Aluminum, terra cotta, and DWV.
    c. Galvanized steel, aluminum and copper.
    d. Galvanized steel, cast iron, and copper.

CHARTS FOR THE QUESTIONS ON THE PREVIOUS PAGE:

Fixture Units Per Fixture Or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Bathroom group - 1 toilet, 1 lavatory, 1 bathtub	8			4"
Bathtub	2	4	1 1/2"	1 1/2"
Shower over tub	3	6	2"	2"
Bedpan washer		10	3"	3"
Bidet	2	4	1 1/2"	1 1/2"
Comb. sink and tray	3		1 1/2"	1 1/2"
Dental cuspidor		1	1 1/4"	1 1/4"
Dental lavatory	1	2	1 1/4"	1 1/4"
Drinking fountain		1/2	1 1/4"	1 1/4"
Dishwasher	2	4	1 1/2"	
Kitchen sink, 1 1/2" outlet	2	4	1 1/2"	
Kitchen sink, 2" outlet		5	2"	
Lavatory	1	2	1 1/4" or 1 1/2"	
Lavatory, beauty parlor		3	1 1/2"	
Laundry tray, 1 or 2 part	2	4	1 1/2"	
Shower, each head	2	4	2"	
Sink, surgeon's		3	1 1/2"	
Sink, soda fountain, bar		2	1 1/4"	

Table of Pipe Sizes

	Maximum Number of Fixture Units That May be Connected to-							
Diameter of Pipe (inches)	Building Drain of Sewer Fall per Foot				1 Horizontal Branch	Not Over 3 Branch Intervals	Stacks With 3 or more Branch intervals	
	1/16"	1/8"	1/4"	1/2"			In 1 Branch Interval	Total in Stack
1	2	3	4	5	6	7	8	9
1 1/4					1	2	1	2
1 1/2					3	4	2	8
2			21	26	6	10	6	24
2 1/2			24	31	12	20	9	42
3			* 27	*36	* 20	30	11	60
4		180	216	250	160	240	50	500
5		390	480	575	360	540	200	1,100
6		700	840	1,000	620	960	350	1,900
8	1,400	1,600	1,920	2,300	1,400	2,200	600	3,600
10	2,500	2,900	3,500	4,200	2,500	3,800	1,000	5,600
12	3,900	4,600	5,600	6,700	3,900	6,000	1,500	8,400
15	7,000	8,300	10,000	12,000	7,000			

CHART FOR THE QUESTIONS 11-15 ON THE PREVIOUS PAGE:

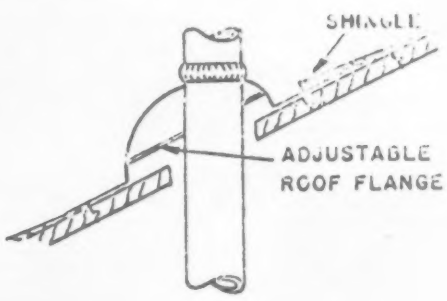
Fixture Units Per Fixture or Group				
Fixture Type	Number of Units		Trap	Drain
	Private	Public		
Sink, flushing rim F.V.		10	3"	
Sink, service (trap stand)		3	3"	
Sink, service		3	1 1/2"	
Sink, pot or scullery		4	1 1/2"	
Urinal pedestal		10	3"	
Urinal (wall lip)		5	1 1/2"	
Urinal stall		5	2"	
Wash sink (each set of faucets)		2	1 1/2"	
Water closet	6	12	3"	

17. Name the three metals used for roof flanges:

a. copper, aluminum, and bronze.
b. galvanized sheet steel, copper and lead.
c. nickel, lead, and galvanized sheet steel.
d. aluminum-magnesium alloy, lead and nickel.

18. How could the roof flange in the illustration below be made watertight?

a. Use any non-flexible cement.
b. Use lead caulk.
c. Use a roof flange gasket.
d. Use bituminous roof cement.



19. How many gallons per minute will be drained by a 5-inch combination wye and one eighth bend? The formula for determining capacity of fittings is $C = KD^2$.

a. 596.2 GPM.
b. 478.9 GPM.
c. 621.7 GPM.
d. 562.5 GPM.

20. What is the advantage of an adjustable roof flange?

    a. Lightweight.
    b. Very inexpensive.
    c. Can be adjusted to any pitch roof.
    d. Can adapt to any type of roof.

73.01.02.05

21. A vent stack is connected to the soil or waste stack with a wye fitting placed at least:

    a. 6' below the lowest branch.
    b. 4' below the lowest branch.
    c. 5' below the lowest branch.
    d. 3' below the lowest branch.

22. Fittings in the main drain, for branches, should always pitch up to allow the branch at least:

    a. 3/4" per foot pitch.
    b. 1/8" per foot pitch.
    c. 1/2" per foot pitch.
    d. 1/4" per foot pitch.

23. Which of the following kinds of pipe is best for branch waste pipe?

    a. Brass.
    b. Galvanized iron.
    c. Copper tubing.
    d. Lead.

24. What becomes of the rust scale that falls down in a vent stack?

    a. It clings to the sides of the pipes throughout the system.
    b. Remains in the vent stack.
    c. It is "trapped" by the drain traps.
    d. It is carried away in the main drain.

25. Describe the fitting in the lower end of a 5" soil stack to which a 3" vent stack is to be attached:

    a. a 3" x 5" sanitary tee.
    b. a 5" x 3" short turn TY.
    c. a 3" x 5" long turn TY reducing.
    d. a 5" x 3" medium upright wye.

73.01.02.06

26. Which of the following is not a type of S trap?

a. Full S
b. 1/3 S.
c. Running trap.
d. 1/2 S.

27. What is the usual size seal for a soil pipe trap?

a. 3".
b. 5".
c. 7".
d. 9".

28. What is a safe depth of seal for a trap?

a. 3 1/4" to 3 3/4".
b. 6" to 8".
c. 3/4" to 1".
d. 2 1/2" to 4".

29. Which of the following types of pipes is used with drainage traps?

a. Galvanized wrought iron.
b. Cast iron.
c. Brass.
d. Copper tubing.

30. Soil pipe traps are made in sizes:

a. 3" to 18".
b. 1" to 12".
c. 2" to 15".
d. 4" to 16".

73.01.02.07

31. What size pipe should be used to vent a lavatory?

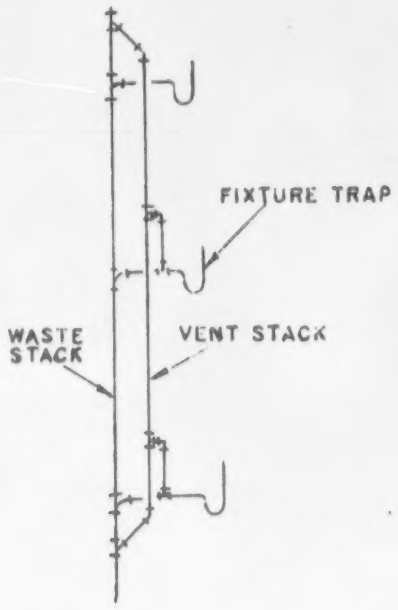
a. 1 1/4".
b. 1".
c. 1 1/2".
d. 2".

32. How high should a branch vent be placed?

    a. 8" above the flood rim of the fixture it serves.
    b. 6" above the flood rim of the fixture it serves.
    c. 12" above the flood rim of the fixture it serves.
    d. 4" above the flood rim of the fixture it serves.

33. What size pipe is required for the waste and vent stacks in the illustration below?

    a. 2" waste stack and a 1 1/2" vent stack.
    b. 3" waste stack and a 2" vent stack.
    c. 1" waste stack and a 1/2" vent stack.
    d. 2 1/2" waste stack and a 3" vent stack.



34. Why should a branch vent to a single fixture be short?

    a. So that air will circulate in the branch.
    b. To increase the atmospheric pressure in the system.
    c. To increase the atmospheric pressure in the system.
    d. To save on the expense of pipe.

35. Siphonage may occur if the tee in a waste pipe is placed:

    a. below the seal of the trap.
    b. above the seal of the trap.
    c. to the right of the seal of the trap.
    d. to the left of the seal of the trap.

73.01.02.08

36. On which of the following are loop or circuit vents used?

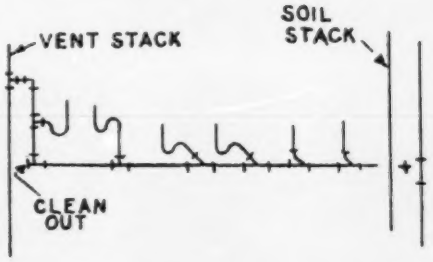
a. Two-story fixtures.
b. A single fixture.
c. A line of fixtures.
d. Multiple story fixtures (more than 2 stories).

37. What is a "loop vent"?

a. The soil and vent stacks are located at opposite ends of a group of fixtures.
b. The soil and vent stacks are both located at the same end of a group of fixtures.
c. The soil stack runs horizontally while the vent stack runs vertically when connected to a group of fixtures.
d. The soil stack runs vertically while the vent stack runs horizontally when connected to a group of fixtures.

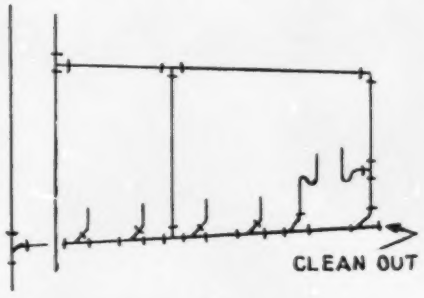
38. What type of vent is illustrated below?

a. Loop vent.
b. Yoke vent.
c. Circuit vent.
d. Relief vent.



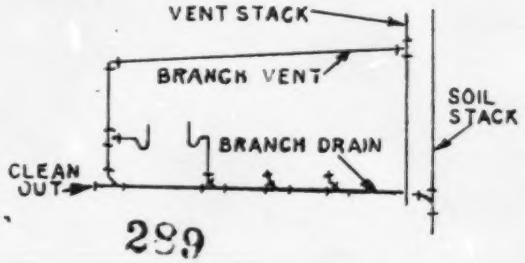
39. What type of vent is depicted by the illustration below?

a. Yoke vent.
b. Relief vent.
c. Loop vent.
d. Circuit vent.



40. What type of vent is illustrated below?

a. Loop vent.
b. Circuit vent.
c. Relief vent.
d. Yoke vent.



73.01.02.09

41. Who usually installs outside leaders above ground?

    a. Building architect.
    b. Roofing contractor.
    c. Plumber.
    d. House owner.

42. Inside rain leaders are subject to the same regulations as:

    a. Vent stacks.
    b. Outside rain leaders.
    c. Drain pipes.
    d. Grease traps.

43. Basements are likely to be wet, especially in rainy weather when:

    a. The rock bed or secondary layer of soil is in extent of 150 feet.
    b. There is construction in Southern wet climates.
    c. The water table is below 150 feet.
    d. Ground water is close to the surface.

44. How many types of cellar drainers are there?

    a. 5.
    b. 3.
    c. 4.
    d. 2.

45. The type of drainer which is the least expensive to operate is the:

    a. Air pressure siphon.
    b. Water pressure siphon.
    c. Electrically driven centrifugal pump.
    d. Steam pressure siphon.

73.01.02.10

46. The house drain connects with house sewer how many feet outside the foundation wall?

    a. 5'.
    b. 10'.
    c. 7'.
    d. 15'.

47. What determines the size of the house drain?

a. The type of sewer line used.
b. The size of pipe used in the building.
c. The heighth of the structure.
d. The number of fixtures to be drained.

48. Why is it important to have a current of fresh air passing through the drainage system at all times?

a. This carries away all gases from the sewage.
b. Keeps the atmospheric pressure throughout the entire system at a constant level.
c. Prevents siphonage.
d. Prevents back pressure.

49. Bureau of Health Codes require that all branches shall enter horizontal drains at an angle not greater than:

a. 45 degrees.
b. 30 degrees.
c. 60 degrees.
d. 90 degrees.

50. What type of bend may be used on horizontal pipes so that the flow of sewage may not be retarded?

a. Long turn 45 degree bends.
b. Short turn 60 degree bends.
c. Long turn 90 degre bends.
d. Short turn 45 degree bends.

73.01.02.11

51. All codes require cleanouts at the base of:

a. all stacks and inside rain leaders.
b. all vents and all stacks.
c. all inside and outside rain leaders.
d. all vents and outside rain leaders.

52. Where is the best location for a cleanout?

a. At 45 degree bends.
b. Near every second fitting.
c. At 90 degree turns.
d. At each change of direction.

53. Cleanouts shall be the same size as the pipe up to:

a. 4".
b. 3".
c. 5".
d. 6".

54. Cleanouts on larger pipes shall be not less than:

a. 7" in diameter.
b. 5" in diameter.
c. 6" in diameter.
d. 4" in diameter.

55. How should a plumber connect the iron body of a cleanout to the soil pipe?

a. Caulked.
b. Welded.
c. Gasket.
d. Cemented.

73.01.02.12

56. Which of the following is placed in a window well, driveway or any paved surface to carry away rain water?

a. Floor drain.
b. House drain.
c. Area drain.
d. Main house trap.

57. Area drains must be equipped with which of the following in order to protect their seals in periods of drought?

a. 180 degree wyes.
b. Cleanouts.
c. Deep seal traps.
d. 90 degree TYs.

58. In the formula provided below, what does "D" stand for?

a. The weight of the drain.
b. The diameter of the drain.
c. The drain cover material (iron, steel, etc.)
d. The distance the drain will be from the lowest portion of the floor.

$$D = 12 \quad \frac{AP}{212 \times 60}$$

59. What does the letter "P" stand for in the formula provided on the previous page?

a. The atmospheric pressure for drain operation.
b. The type of pipe to be used for the drain.
c. The maximum precipitation in feet per hour rate of rainfall for your state.
d. The maximum pressure the drain system will be able to withstand.

60. How may the seal be maintained on a basement floor drain?

a. Lubricating with multi-purpose grease.
b. By occasionally adding water.
c. Squirting it with automotive oil.
d. Replacing it every three months.

73.01.02.13

61. What fixture is usually stopped by hair?

a. Toilet.
b. Lavatory.
c. Laundry tub.
d. Utility sink.

62. How should a lead pencil be removed from a toilet bowl?

a. Closet auger.
b. Coil wire with cutting head.
c. Power driven coil wire.
d. Bent wire.

63. Which of the following cleaning tools should be used on a toilet?

a. Closet auger.
b. Grappler.
c. Plunger.
d. Coil head wire.

64. How is a plumber to determine the location of a stoppage?

a. Using a closet auger.
b. Inserting a "test" line.
c. Tapping the pipe with a hammer.
d. Using a coil wire head.

65. What must be done in some cases of stoppage by grease?

a. Use a closet auger.
b. Using a grappler.
c. Use a plunger.
d. Insert a coil wire with cutter.

UNIT TEST ANSWER SHEET

Post Test

Occupational Area:
File Code: 73.01.02.00.B2-2
Name:

ANSWERS

73.01.02.01	1. D		73.01.02.05	21. A		73.01.02.09	41. B
	2. D			22. A			42. C
	3. B			23. D			43. D
	4. B			24. C			44. D
	5. D			25. D			45. C
.01.02.02	6. D		73.01.02.06	26. B		73.01.02.10	46. A
	7. A			27. A			47. D
	8. A			28. D			48. A
	9. B			29. A			49. A
	10. D			30. C			50. C
.01.02.03	11. C		73.01.02.07	31. A		73.01.02.11	51. A
	12. C			32. B			52. D
	13. C			33. A			53. A
	14. D			34. A			54. D
	15. D			35. A			55. A
73.01.02.04	16. D		73.01.02.08	36. C		73.01.02.12	56. C
	17. B			37. B			57. C
	18. D			38. C			58. B
	19. D			39. B			59. C
	20. D			40. A			60. B

UNIT TEST ANSWER SHEET

Post Test

Occupational Area:
File Code: 73.01.02.00.B2-2
Name:

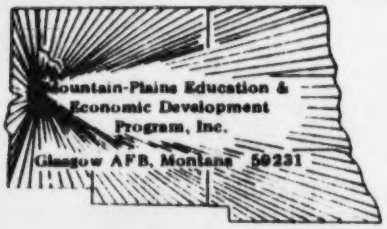
ANSWERS

73.01.02.13

61. B	81.	101.
62. A	82.	102.
63. A	83.	103.
64. C	84.	104.
65. D	85.	105.
66.	86.	106.
67.	87.	107.
68.	88.	108.
69.	89.	109.
70.	90.	110.
71.	91.	111.
72.	92.	112.
73.	93.	113.
74.	94.	114.
75.	95.	115.
76.	96.	116.
77.	97.	117.
78.	98.	118.
79.	99.	119.
80.	100.	120.

Student: _____ File Code: 73.01.02.00.A1-5

Date: _____ Date Published: 7/10/75



Family Pay Number: _____ Sex: M F (Circle 1)

UNIT PERFORMANCE TEST: PLANNING, LAYOUT AND ASSEMBLY

OBJECTIVE 1:

Given an elevation plan, draw a complet rough-in of a typical drainage and vent system for the bath of a residential dwelling.

OBJECTIVE 2:

Given an elevation plan, lay out a complet rough-in of a typical drainage and vent system for the bath of a residential dwelling.

OBJECTIVE 3:

Given an elevation plan, assemble a complete rough-in of a typical drainage and vent system for the bath of a residential dwelling.

TASK:

Given a floor plan, the student will plan, layout and assemble a complete drainage and vent system for a bathroom in a typical domestic dwelling.

ASSIGNMENT:

CONDITIONS:

The student will be supplied with the necessary tools and equipment to complete the job. He may use any reference materials available. No assistance will be obtained from other students or the instructor.

RESOURCES:

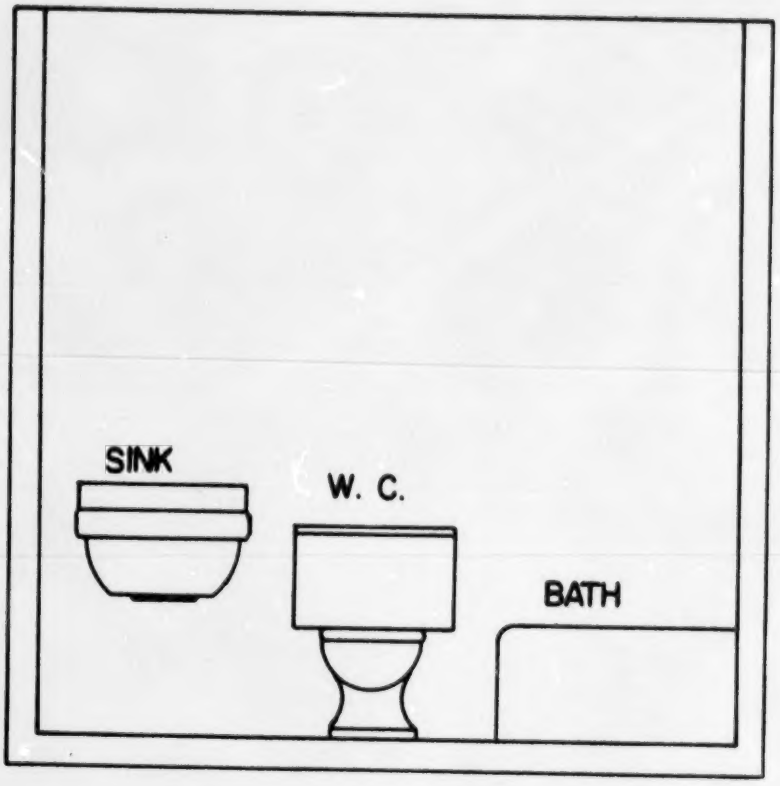
1 Printed Materials:

Montana State Plumbing Code.
Related Information: Plumbing I and II, Harry Slater.
Audels Plumbers and Pipe Fitters library materials.

2. Equipment;

Typical hand tools (hammer, screwdriver, pliers, etc.)
Pipe threader
Pipe cutter
Soil pipe cutter
Lead pot
Lead furnace
Ladle
Caulking irons
Tape measuring
Plastic pipe cutter
No-hub soil pipe
Plastic pipe
Assorted pipe fittings
Yarning irons
Test plugs

ASSIGNMENT SHEET



Student: _____ File Code: 73.01.02.00.A1-5

Date: _____ Date Published: _____

Family Pay Number: _____ Sex: M F (Circle 1)

PERFORMANCE CHECKLIST:

OVERALL PERFORMANCE: Satisfactory_____ Unsatisfactory_____

	CRITERION Met	Not Met
Objective 1:		
1. Drawing is neat.		
Criterion: It is readable.		
2. Drawing is accurate.		
Criterion: a. Conforms to the State Plumbing Code.		
b. Conforms to the floor plan.		
Objective 2:		
3. Measurements are accurate		
Criterion: To ± ¼" of plan.		
4. Pipe and fittings are appropriate.		
Criterion: State Plumbing Code.		
Objective 3:		
5. Uses appropriate tools.		
Criterion: Text, Hand Tools, Westinghouse Learning Corp., Section I, II.		

	CRITERION Met	Not Met
6. Follows safe practices and procedures.		
Criterion: OSHA.		
7. Assembly is neat and presentable.		
Criterion: a. State Plumbing Code.		
b. Plumb, square, and level to ± ¼", where appropriate		
c. Graded to code.		
d. Meets Building Codes.		
8. System functions properly.		
Criterion: a. Upon water test, no leaks.		
b. State Plumbing Code.		
9. Completes the job in a reasonable time.		
Criterion: 12 hours.		
Student must complete 7/8 line items except item 8 must be		
satisfactory to pass.		